3D world

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LIGHTWAVE
MAYA XSI
3DS MAX

CINEMA 4D R8
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20-PAGE LIGHTING SPECIAL

SEE THE LIGHT

>> **FEATURE** EXCITING NEW LIGHTING TECHNIQUES
>> **PRO TIPS** 10 ILLUMINATING SHORTCUTS
>> **TUTORIAL** BEYOND 3-POINT LIGHTING

SELLING A SKYLINE
HOW VISUALISATION SOLD NORMAN
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VIEWPOINT
JASON BUSBY ON WHY
HE WORKS FOR FREE **p20**

ON THE CD >>

Mac OS X v10.2. Suddenly operating systems seem so 20

other
th century.

Mac OS X v10.2 is widely acclaimed as the ultimate operating system for the new millennium. It blends Apple's legendary ease of use with the rock-solid reliability of UNIX. And this latest version of Mac OS X is every bit as innovative as the computers that run it.

Whether you are a Mac user who is upgrading, a Windows user who is thinking of switching to a Mac or even a UNIX user who relishes the idea of commanding an advanced, crash-proof and secure UNIX-based operating system, this is the one for you.

Quartz Extreme is another great feature, giving you graphics that are incredibly fast. Mac OS X uses the power of your computer's built-in graphics engine to make your desktop – and everything you see – more responsive. This hardware accelerated, fully composited graphics system gives souped up 2D and 3D capabilities.

Then there is Rendezvous, revolutionary technology using the industry standard IP networking protocol that lets you create an instant network of computers, printers and other peripheral devices over AirPort, Bluetooth, USB or FireWire – without having to manually configure drivers or settings. Mac OS X does it all for you – automatically.

Mac OS X v10.2 also debuts QuickTime 6, the next generation multi-media standard that supports MPEG-4 video, the new worldwide medium for playing and viewing professional quality audio and video on the internet.

Combine these and many other great features with the fact that the complete Adobe Design Collection runs superbly on Mac OS X and you have an operating system that leaves others where they belong – firmly in the past.

www.apple.com/uk/macosx

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LATEST RELEASE DEMO
CINEMA 4D R8

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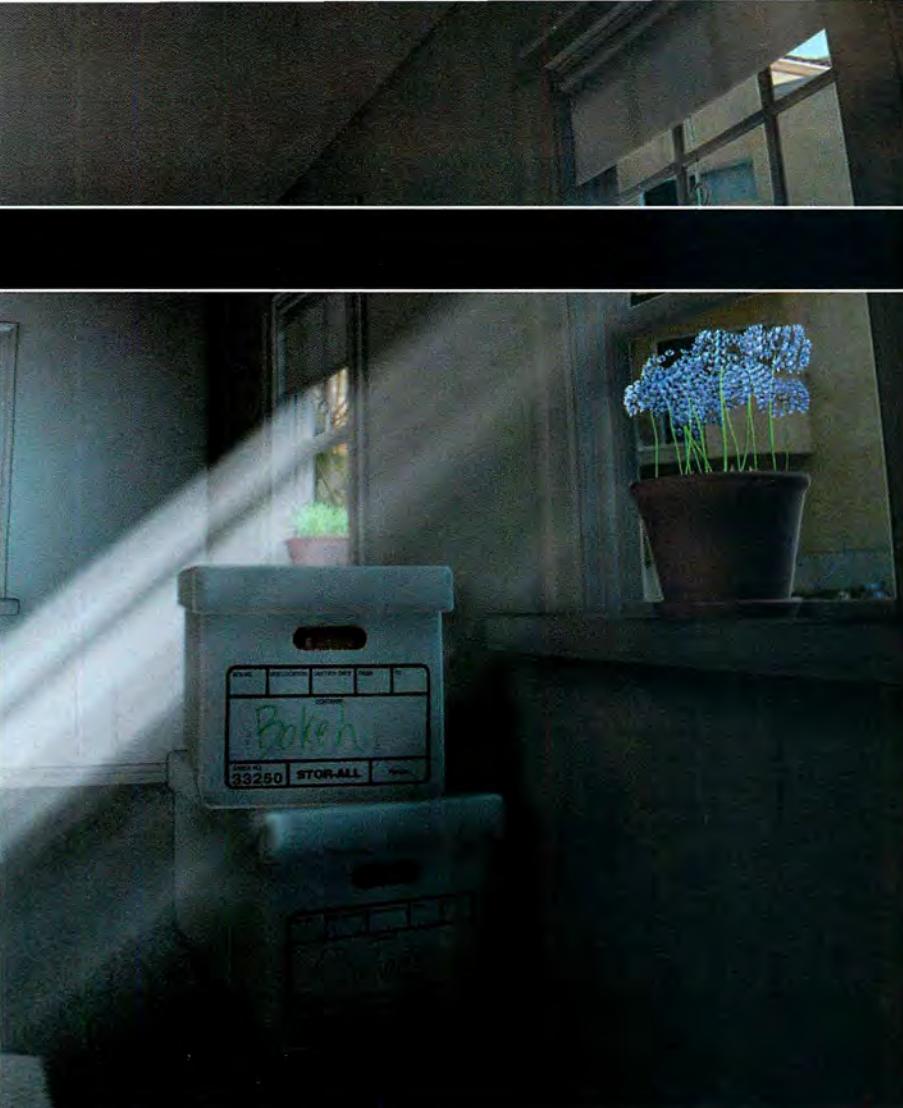
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>> Recreate this striking subway scene with the help of our cover software and complete tutorial

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>> **SUBSCRIBE**
SAVE MONEY · **PAGE 030**

Francois Rimasson

TITLE: CONCRETE
USING: *3DS MAX* AND *PHOTOSHOP*

"I am 32 years old and I live in Paris, France. I started using computers almost 15 years ago. I dropped out of art school early during my bachelor's degree to pursue the career of CG artist. Professionally, I have been working for about ten years – starting out with graphics for computer games such as *Dark Earth*, moving on to graphics for animated features and films. I worked as a modeller and lighter on *Tristan & Iseut*, *Human Trap*, and the next Enki Bilal movie. At the moment, I'm working on the FMV for the videogame, *Terminator 3*.

In the future, I'd like to work as a TD and CG artist on more films, and maybe to move to San Francisco. The cover image, Concrete, is a tribute to the Japanese architect Tadao Ando."

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[w]: http://perso.wanadoo.fr/rimasson

CD CONTENTS & EDITOR   #007

cd contents

SEND CD CONTENT TO: matt.gallimore@futurenet.co.uk

PC ONLY

trueSpace3 (full product)

Model, animate, and render with the full commercial version of Caligari's popular 3D package, *trueSpace3* (as sold for $595). Use it to follow our tutorial on page 60 of the magazine
>> www.caligari.com

PC ONLY

3D Buzz video tutorial

This issue, Jason Busby of 3D Buzz has supplied us with an exclusive 80-minute video tutorial introducing the unique interface in *trueSpace6* (demo also included on the CD)
>> www.3dbuzz.com

PC ONLY

WireFusion 2.1 (full product)

WireFusion is designed to create interactive Web content. On the disc is the full version of release 2.1 (as sold for £318), the demo of release 3, plus the demo of 3D plugin *WF-3D*
>> www.demicron.com

DUAL FORMAT

Cinema 4D R8

The eighth incarnation of Maxon's flagship 3D application is here! This demonstration version for the PC and Mac is fully functional, except for being save-disabled
>> www.maxon.net

PLUS

BOOK CHAPTER
An extract from *Essential CG Lighting Techniques* by Darren Brooker (in PDF format)

Q&As AND TUTORIALS
Full-size screenshots and supporting files for our Q&A and Tutorial sections

EXHIBITION IMAGES
Send your pics or animations to **3dw.exhibition@futurenet.co.uk**

Full listings on the CD sleeve
Software not working as expected? Can't find those tutorial files? Check out the instructions inside our CD inlay for the solutions to the most common disc-related problems

editor's perspective

The painter Henri Matisse described it as "calm and voluptuous". The writer Samuel Beckett described it as "annihilating the stars". And dear old Morrissey – a cultural reference point that will fortunately be lost on our overseas readers – said it "never goes out".

Their common subject matter? Light. Which is fortunate, since light – whether shining or guiding, omni or directional – is an essential part of any CG project. And in recognition of this fact, we've decided to devote an entire issue of *3D World* to it.

If you're just starting out, you may be best turning to our cover CD, where you can find an introductory chapter from the excellent *Essential CG Lighting Techniques*. On page 52, author Darren Brooker explains how to modify that basic three-point lighting system to create subtle nuances of tone and mood.

But if you're already an old hand, you'll need to know what the Next Big Thing will be. In which case, check out our lead feature, in which Jeremy Birn – the man responsible for industry bible *[digital] Lighting and Rendering* – provides the low-down on bleeding-edge technologies such as HDRI, caustics, Bokeh effects and lens simulation. Or turn to page 46, where our panel of experts will be revealing their favourite pro tricks.

And on our packed CD, you can find not one but two full products – one of them the world's most widely used 3D app. With its icon-driven interface and shallow learning curve, *trueSpace3* forms an excellent introduction to the world of CG, and to help you get to grips with it, we've provided full tutorials on both page 62 of the magazine and on the CD itself.

If creating interactive online content is more your thing, we've also got a full version of Demicron's Web 3D application, *WireFusion 2.1*. Not to mention the first ever demo of Maxon's flagship package, *Cinema 4D R8*: a piece of software that this month drove our reviewer to unprecedented paroxysms of joy. You can find out exactly how much Adam liked it on page 76.

And don't forget to fill out our *3D World* reader survey (more details on page 45). As well as determining what goes in future issues of your favourite 3D magazine, you could win some fabulous prizes, including £500 of training vouchers. Head along to www.3dworldmag.com/survey and vote now!

JIM THACKER Editor
jim.thacker@futurenet.co.uk

letter of the month

Having just finished reading your excellent article about getting a job in the 3D industry [issue 31], I feel that there is one important aspect missing from the discussion: making the job yourself. By which, I don't mean founding your own company – and I definitely don't mean freelancing. No, here's how I did it...

When I started in 3D, I was enrolled at the officer school of the Finnish Tank Brigade. In the evenings, I studied *Maya* and *After Effects*, while my wife taught me *Photoshop*. For two years, I worked in my spare time until I felt ready to sell my ideas to my employer, Finnish Defence Forces. I suggested that I could help make better presentations for new urban warfare projects – in 3D, of course. I also suggested that animations could be used in conscript training, and that I could create logos and short films for officers' meetings.

In a month I was transferred to the regiment staff. I got my own room, a workstation with a Wildcat 5110, dual processors, and twin displays, a digital video camera, *Maya*, *After Effects*, *Photoshop*, *Illustrator*, *Poser* – and on and on. Now I work office hours creating visual effects for the Defence Forces.

Before, I truly felt the competition. I worried that others would study harder than me. With two little kids and a full-time job, I wondered how I would ever get a chance to work in this industry. Now I know that there was no need. Good workers are always in demand, so new jobs will always come along.

I don't get a good salary (£1,200 a month), but I don't need one. I have an interesting job, time for my family, and a chance to make money in future, if it ever becomes necessary.

Lieutenant Tommi Kangasmaa | Finnish Defence Forces

THINK DIFFERENTLY

>> Having read *3D World* since the very first issue, I've learned quite a bit about hardware, software, and production techniques, and wouldn't dare to ask for anything more on that side. Instead, I've decided to ask for something totally different.

The one thing I feel is missing from the magazine is the issue of how to develop your aesthetic senses. The more I've studied, the more I've realised that the idea is everything. But as 3D is definitely an immature art form, it tends to rely on technique rather than idea. So how about telling us how to avoid the worst clichés?

I've enjoyed a lot of your articles concerning classic composition, lighting, and acting skills. As a sequel, it might be the time for tutorials on developing ideas and visual style. These could feature things like art theory, art history, the basics of drama, use of mind maps, creative thinking and so on. In short, going back to basics.
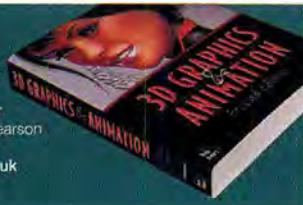
Packages such as *Maya* and *3ds max* are now so complicated that you can spend a lifetime trying to memorise what every button does. But the last thing good designers do is waste their lives learning the details of software. So please, give us nerds a tutorial – or at least an interview – on how to create like an artist.

Harry Seppälä | Finland

While I'd take issue with the statement that 'the idea is everything' – even at the wilder extremes of conceptual art, it's hard to get by without some kind of technical expertise – I'd certainly agree that there's more to 3D than pushing buttons. But we've always assumed that people read the magazine precisely because they do want to learn the details of software. Have we got the balance wrong? Let us know if you agree with Harry, and we'll reconsider our position.

CD TUTORIALS

>> As a long-time reader of *3D World*, I look forward to receiving the magazine each month. But why don't you provide more tutorials to accompany the software included on your cover CD? Being a *trueSpace* user, I was glad to see a demo of the latest version on issue 29, but there was no tutorial to demonstrate the new features. It's hard to make a purchase decision without an idea of the value of the additions to a package. Would it be possible to provide a tutorial, even on the CD, for all the packages it contains?

Jim Putnam | via email

Good news for *trueSpace* fans: our two-part tutorial starts on page 60, and you can find version 3 of the software on this month's CD

While we do try to provide tutorials for the major products featured on our cover CD, space sometimes prevents us from doing the same for all the demos – particularly if they come in shortly before an issue goes to press. However, there's good news for trueSpace users: this month sees the first part of a two-part tutorial devoted to the package, and we'll be featuring the software in our Q&A section in future.

Some sand, yesterday. Just one of the more unusual free gifts we seem to have been giving our overseas subscribers...

SHOWING UP

First, I take great pleasure in thanking you and your publisher for an excellent magazine and for the recent Digital Arts World show [news, issue 32]. As a *3ds max* user, I was pleased to see Discreet showing us the new features of version 5, and the chance to speak to heroes such as [*Spider-Man* lead character animator] Spencer Cook made it an event you really couldn't afford to miss.

On the hardware side, IBM made me wish once again that I hadn't spent my money on sweets as a child, and had saved for an IntelliStation M Pro workstation instead. I was only disappointed by the absence of Dell Computer and Corel. Maybe next year, AMD and Intel will have a presence to show their performance with the various manufacturers.
Michael Jackson | Hertfordshire, UK

While we can't speak for the hardware manufacturers, there will certainly be another Digital Arts World show in 2003. We hope to see you there!

PC-ONLY EDITION?

Most importantly, I love your magazine. I have been following *3D World* almost every month, unless my local bookstore sells out. But I'm not a subscriber. Why? Because I only buy the magazine if there are a majority of Windows-based tutorials. If there is more Mac-based content, I usually pass the issue up.

Are there any plans to divide *3D World* into separate editions, based on OS? How about *3D World for Windows* and *3D*

World for Non-Windows (to cover Mac OS X, Linux, and UNIX)? Or even on the basis of hardware: *3D World Apple* and *3D World PC*? I'm sure there are a lot of tutorials you could include – just not enough space in the magazine to cover them.
Woody Chan | via email

Since many of our readers work across more than one hardware platform, there are currently no plans to divide 3D World into system-specific editions. And before we receive emails from irate Mac addicts complaining about being described as 'Non-Windows Users', can we point out that the term was Woody's, not ours...

TRUE GRIT

Just received issue 31 in the mail today, and the plastic wrapper was full of sand! Where do you ship your magazines from? The Sahara?
Arne Kaupang | Norway

No, just Somerset. I'm tempted to say that the sand grains were a free gift to accompany the particles feature, but that would be a terrible pun, so I shall refrain.

GAME ON

Being interested in 3D animation and computer games, I recently got hold of a copy of *Unreal Tournament*, which now comes complete with *Maya PLE*. Can you please publish a series of

articles on the creation of levels and characters for this game? I would be particularly interested in learning what makes a good design, and how you go about creating a level from conceptual artwork to finished product.
Dave Germain | via email

While a series of articles devoted to a single title would probably be overkill, we are trying to include more videogame-related tutorials in 3D World. In particular, look out for our article on modelling tracks for Total Immersion Racing *in issue 34.*

TROUBLE AND STRIFE

First, let me say that your magazine is 'acceptable'. As a subscriber since issue 1, I have seen several changes: some good, some not so good. But the new layout is excellent: clear, well laid out, and inviting you to read more – and there lies the rub.

You see, there is just too much editorial for me to read in a month, so my wife is always telling me to get my head out of that stupid magazine and do this or that around the house. Unfortunately, the mag has recently become *so* acceptable that she is now an avid reader herself – and I'm asking for my copy back.

Thanks for an excellent read and some truly outstanding software. PS: Are wives allowed to take out subscriptions?
John Docking | via email

But of course. As are husbands, girlfriends, partners, and all manner of other significant others. We'll even accept subscriptions from household pets, providing they can produce a valid credit card...

Can't think of a suitable Xmas present for your dog? Then why not turn to page 30 and buy them a year's subscription to your favourite 3D magazine?

NEWSDESK

MENTAL RAY FOR FREE

THE INDUSTRY RESPONDS

Last month, Alias|Wavefront made mental ray free to every Maya 4.5 user. So this month, we invited the industry to comment on the move...

First came the price-cutting battles and the skirmishes with free learning editions. Now, Alias|Wavefront's latest move in the 3D application war has been to give *mental ray for Maya 1.5*, the rendering system previously sold for £3,350, free to customers with *Maya 4.5*. For the end users this has to be good news. But what effect will it have on the market and the competition?

Michael Stojda, Managing Director of Softimage, has no doubts about the reasons for the move. "This announcement is a clear defensive and copycat move to slow down the exodus rather than a move to provide new innovations to the industry. The only real news is they decided to give away for free a plugin that they clearly have not been able to sell to date," he declares. "I say the latter as companies usually do not give away products that are selling well and generating revenue."

"Our competitors are struggling to keep up with our leadership, often saying all sorts of interesting things to explain the pace of our innovation and to justify our success," replies Shai Hinitz, *Maya* Product Manager at Alias|Wavefront. "We continue to aggressively invest in the development of *Maya* in order to ensure that it remains the product of choice in the high-end film, broadcast, video, Web, and games markets. We understand that customers have other 3D options and want to make sure they continue to invest in AIW and *Maya*. We are confident that by injecting this value in to *Maya*, more people will purchase it, thus not only offsetting the cost difference, but at the same time increasing our revenue and sales volume in the process."

LIGHT THE TOUCH PAPER...

Stojda remains dismissive about his rival's motives. "All of these actions appear to be driven by two facts: many of [Alias|Wavefront's] customers are switching to *XSI* or seriously considering doing so – in part due to the specific issues highlighted by this announcement: namely, that *XSI* offers, today, the most seamlessly integrated and most efficient workflow overall as well as high-quality rendering. Many of their customers recognise that Alias is no longer focused on their production needs. Alias appears to have shifted the focus away from the core professional 3D market to selling low-cost products into the prosumer space."

"We have always known that render quality and price are important to users. However, Maxon has found that these are not the only factors that affect a purchase decision," points out David Link, CEO of Maxon. "Ease of use, speed, stability, and features are all vital, especially to new users, who demand powerful software with a shallow learning curve. *Cinema 4D* has long been lauded for its excellence all in these areas."

The NewTek camp is similarly measured in its response to the move. "We're very pleased for *Maya* owners that they are going to receive *mental ray* for free, but then NewTek has always had a policy of giving more 3D power for less money," comments Franck Lafage, Managing Director of NewTek Europe. "They will be getting a good, single-node render engine, albeit without being able to render some of *Maya's* features, such as Fur, Paint Effects, and particles," he continues. "But by contrast, *LightWave* has always had a built-in proprietary network-capable rendering

> "COMPANIES USUALLY DO NOT GIVE AWAY PRODUCTS THAT ARE SELLING WELL"
> **MICHAEL STOJDA**, SOFTIMAGE

RIGHT: **"The free product is a plugin and does not give users a direct access to *mental ray* technology,"** claims Michael Stojda, Managing Director of Softimage

FAR RIGHT: **"Our competitors are struggling to keep up with our leadership,"** says Shai Hinitz of Alias|Wavefront

UPPER RIGHT: **Sample *mental ray* renders**

solution that is without peer and used by many studios the world over as an example of quality. These days, the real story is not about price and performance, though. We won that battle a long time ago. Now it's about shortening the learning curve; making people as productive as possible, as soon as they can be. To that end, NewTek Europe is now offering *LightWave* with over fifteen hours of tutorial material on DVD, presented by some of the leading effects and character animators in the industry."

...AND RETIRE

Product plugging aside, Lafage's reference to the single-node nature of the plugin is worth noting. *Mental ray for Maya 1.5* can use up to four CPUs on the same workstation. This is fine for small-scale use, but to use more for rendering still requires the purchase of additional *mental ray* licences.

Back at Softimage, Stojda also questions just how useful *mental ray for Maya 1.5* really is. "The free product is a plugin and does not give users a direct access to *mental ray* technology like *XSI* does today, and has for the past three years. This has huge impact on workflow, as in the case of *Maya*, a user would be previewing renders and setting up work with one technology and rendering in another, which would then produce a different look."

Stojda also responds to the original press release about the free plugin, which states that, 'Alias\Wavefront and mental images are committing to develop and integrate *mental ray for Maya* as a standard rendering feature in future versions of *Maya*'.

"Alias acknowledges the product it is giving away is not what the market wants – again, why it is now free? – by stating their intent to develop some time in the future – no date specified – a product with *mental ray* technology integrated. Softimage invested four years in development of integrated rendering and it will likely be quite some time before Alias can deliver what has already been available today for years in *XSI*, by which time of course, Softimage will have once again pushed integrated and in-context rendering to a new and higher level."

"*Mental ray for Maya* is nicely integrated into *Maya* today," counters Hinitz. "We will continue to enhance the degree of integration and there are no plans to suddenly start charging for it in some future version. This is the real deal: if you have *Maya 4.5* you can go get *mental ray for Maya* off our site today." ■

"OUR COMPETITORS ARE STRUGGLING TO KEEP UP WITH OUR LEADERSHIP."

SHAI HINITZ, ALIAS\WAVEFRONT

INTEL INTRODUCES HYPERTHREAD ENABLED CHIP

3.06GHz P4 brings super-fast multi-threading to PC users

Intel's first hyperthread enabled chip, the 3.06GHz Pentium 4, will be available in December this year. Hyperthreading is a form of simultaneous multi-threading technology that makes it possible for different elements of the CPU to be active at the same time so that the chip effectively operates like two separate devices, thus giving a performance boost without the need to use more powerful or dual processors. Intel estimates that the feature can provide speed boosts of up to 30%.

On a machine equipped with a hyperthreaded chip, the operating system carries instructions as if there are physically two processors on board, with the two threads working together in parallel on the single chip. Intel reckons that a regular single thread typically uses just 35% of available processor resources, so adding a second simultaneous thread makes good use of the slack. One thread might use floating-point resources, for example, while the second could be accessing cache memory, or performing integer calculations. There are inevitably many areas of the chip that are shared by the two threads, though, and times when both threads will need to use them. This explains why running two threads doesn't simply double performance.

Multi-threaded and multi-processor aware applications will automatically reap the benefits of the new technology, though further optimisation is needed to get the most out of the system. It's also necessary to have a suitable operating system. At the moment only Windows XP Home and Professional Editions support it, but Intel is currently working to have the technology adopted by the Linux community. It's also necessary to have a motherboard chipset and BIOS that both support HT technology. CONTACT: **www.intel.com/technology /hyperthread**

Prepare to meet thy Doom

Three-level playable demo of id Software's latest and greatest game leaked to the Web

Id Software's *Doom III*: see it in action at a dodgy website near you

Doom III has hit the Web. Arguably the most graphically advanced and eagerly awaited computer game currently in development, the latest update to the first-person shooter from John Carmack and the team at id Software isn't actually scheduled for release until mid-2003. Unfortunately for the developers, a three-level version of the game has been illegally leaked, giving those fans willing to scour the Internet (or to use file-sharing programs) the opportunity to get an early taste of the game's combat horror action. The 380MB file is actually a more advanced iteration of the playable alpha demo unveiled at E3 earlier this year, but id Software is clearly very unhappy that unfinished code is now out in the open.

"This was not leaked on purpose," states Carmack. "Yes, we are upset about it, and it will have some impact on how we deal with some companies in the future, but nothing drastic is going to change in terms of what support is going to be available. Making any judgements from a snapshot intended for a non-interactive demo is ill-advised."

Online postings suggest that id Software watermarks all its code, and so it will be able to track down where the code was leaked. Some posters have suggested that the source is an employee at ATI, and though nothing has been confirmed, ATI has stated that an internal investigation is underway.

As with early titles from id Software, *Doom III* promises to raise the bar for real-time 3D. The game, which requires the very latest T&L-enabled home graphics cards (such as the ATI Radeon 9700, the NVIDIA Geforce 4, and NVIDIA's soon-to-be announced NV30 next-generation range of boards), uses extensive bump-mapping techniques and self-shadowed environments and character models to deliver scenes more detailed than those in any other game to date.
CONTACT: **www.idsoftware.com**

Logical progression

Ex-Mill Film trio sets up LightWave studio

Fuzzygoat is the latest addition the UK post community, formed in the wake of Mill Film's restructure following the decision to drop *LightWave*. Founders Gary Coulter, Caroline Garrett, and Neill Murdoch all previously worked at Magic Camera Company. When that company became part of Mill's Shepperton operation, the trio were instrumental in setting up its *LightWave* pipeline. Together they've worked on *Pitch Black*, *Lost In Space*, *The World Is Not Enough*, *Tomb Raider*, *Pluto Nash*, and *K19: The Widowmaker*.

Unsurprisingly, Fuzzygoat has chosen *LightWave 3D* as its primary animation package. The product will be used alongside Fuzzygoat's own proprietary tools, including *Portal*, a suite of applications for managing and rendering *LightWave* scenes. The commitment to *LightWave* has been further strengthened by Coulter's and Garrett's appointment as technical consultants for Luxology.

"Our goal is to stay reasonably small and flexible," says Coulter. "We are all too aware of the industrial production line-type of working that can arise in a large facility. By keeping Fuzzygoat small we hope to concentrate on the art and craftsmanship of CGI, rather than simple mass production. Coming from a strong effects background, we are currently specialising in VFX and previz work for film and television."

While Fuzzygoat has yet to announce any external projects, it's currently working on in-house animated short, *Cowfarm*. CONTACT: **www.fuzzygoat.com**

"We hope to concentrate on the art of CGI, not simple mass production," says Fuzzygoat co-founder Gary Coulter

SMOKING WITH TWO HEADS

Soho effects studio Smoke And Mirrors is set to expand its 3D horizons with the appointment of a new joint head of 3D to work alongside existing department leader Phil Johnson. Rebekah King-Britton joins from Drum (which was recently merged into Bruce Dunlop Associates), where she worked for six years, following a stint at Electric Image. Her portfolio includes a number of TV channel idents (for clients such as Channel 4 and Paramount), along with ads for Warner Bros. and Blockbuster.

"Along with being a great resource for our advertising clients, [Rebekah's] talents will also provide S&M with a new edge to attract some of the more prestigious broadcast work," says Penny Verbe, Facility Director.
CONTACT: **www.smoke-mirrors.co.uk**

3D courses

London, England
ESCAPE STUDIOS COURSES

New London-based training facility Escape Studios is offering production-skills led courses in 3D animation and 2D effects, created in collaboration with the heads of department from such major UK facilities as Mill Film, The Moving Picture Company and the BBC.

The course curriculum is divided into beginners' and intermediate full-time classes, with part-time extension courses held in the evenings. The year is broken into four ten-week terms, with evening courses lasting between five and ten weeks.

Software covered includes *Maya*, *XSI*, *Shake*, *Deep Paint*, *After Effects* and *Photoshop*, while course tutors are drawn from studios including Double Negative, Tippett Studio, Glassworks and Me Company.

Escape Studios is based at Westbourne Grove in Notting Hill, 30 minutes from Oxford Circus. More info on the website.
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E: info@escapestudios.co.uk
W: www.escapestudios.co.uk

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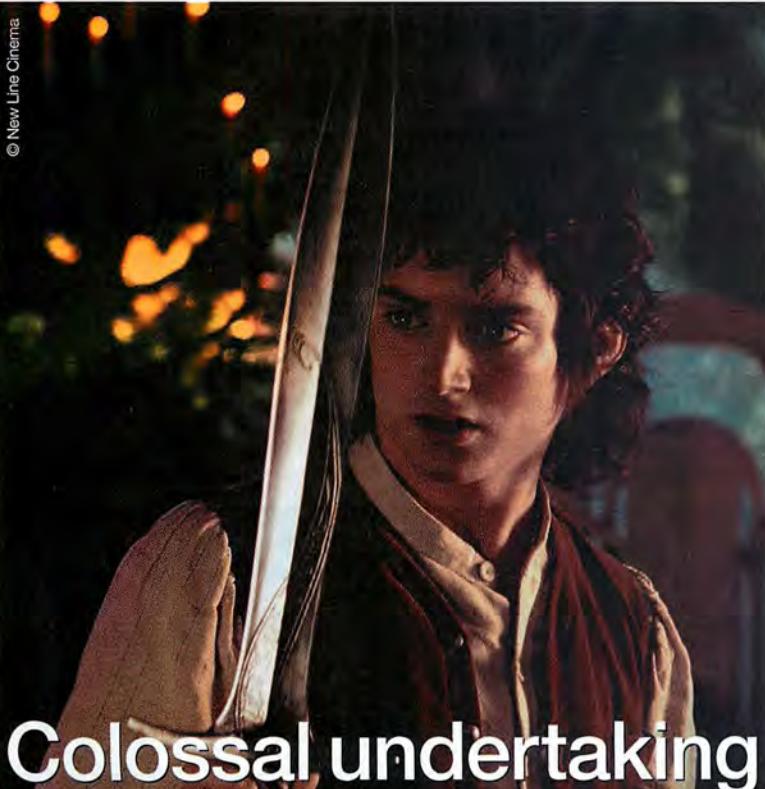
Colossal undertaking

Colorfront to support and further develop Colossus postproduction software in the wake of 5D's collapse

Colorfront has announced that it will pick up support for *5D Colossus* in the wake of its publisher's collapse, which we reported last month. 5D had taken on sales and marketing of all Colorfront products last year, including the *color*star* and *star*dust* plugins as well as *5D Colossus*. The technology was originally developed by the Budapest-based company for the extensive grading work on Peter Jackson's *The Lord Of The Rings* trilogy.

Colorfront retains ownership of the software (the 5D distribution licence had been a non-exclusive one), and intends to continue with its development.

"The exit of 5D is a great loss to the postproduction industry, and we feel a deep sorrow about the personal loss of everyone involved," says Colorfront founder and CEO Mark Jaszberenyi. "Colorfront will continue to offer support and maintenance to the existing users of *5D Colossus*. We are also committed to continuing the development of the software, underlined by a major new release coming before the end of 2002."

The company is currently working to set up a new worldwide reseller network for its software, while working with *Colossus* users to integrate digital intermediate grading into an efficient workflow.
CONTACT: **www.colorfront.com**

Portland, Oregon
MODELLING, ANIMATION, SPECIAL EFFECTS AND COMPOSITING COURSES

Oregon3D has launched the company's Center for Visualization Technologies, in Portland, Oregon. The Center offers 3D graphics professionals a collaborative learning environment and a variety of courses including Directing and Storyboarding for Animation (five days, $1,000), What's New in 3ds max 5 (two days, $600), and flint and flame Advanced (five days, $2,500).
CONTACT: Oregon3D
T: +1 503 626 9000
E: info@oregon3d.com
W: www.oregon3d.com

events

3 DECEMBER
AliasIWavefront's fourth 3December
AliasIWavefront's annual industry event, 3December, will be held for the fourth consecutive year in seven cities throughout the world. 3December draws thousands of 3D professionals and students, who gather to celebrate the industry's achievements and to see first-hand the innovation of leading software and hardware companies. The seven host cities for the event are London, Paris, New York, Tokyo, Los Angeles, Sydney, and Seoul. Each city will create a unique atmosphere for the event that will allow local attendees to experience event exclusives such as industry guest speakers, the latest technology demonstrations, *Maya* masterclasses and more.
www.3december.com

3-5 DECEMBER
Asia Animation 2002
Asia Animation comprises two elements: an exhibition and a two-day conference, featuring some of the industry's leading international speakers.
www.asiaanimation.com.sg

29 JANUARY
Free Houdini Apprentice Fest UK
Held at Escape Studios in London, animators from *Lord of the Rings*, *Blade 2*, and *Harry Potter* will be giving *Houdini* tutorials from a production perspective. Each attendee will get over four hours of individual instruction, the opportunity to meet experienced *Houdini* users, and learn about current UK vacancies for *Houdini* animators.
www.techimage.co.uk

ILMENTAL AS ANYTHING

Mental Images and Industrial Light & Magic have strengthened ties with an agreement that will see the digital effects studio use the *mental ray* rendering software in all future productions. Since 1995, ILM has used *mental ray* on a number of projects, but this new agreement means that in addition to providing regular licensing and customer support, Mental Images will also provide 24-hour turnaround support and on-site development. In fact, the developer will create new functionality to meet the specific needs of ILM productions and to integrate the renderer with the proprietary modelling tools in the studio's pipeline.

"Since incorporating *mental ray* into our pipeline, the team at mental images has been receptive to our needs and suggestions, helping us increase the realism and complexity of our imagery," says ILM's Cliff Plumer. "This new agreement has the potential for true innovation, and we're looking forward to taking the next step in that direction."
CONTACT: www.mentalimages.com

DISCREET CUTBACKS

Discreet is to cut around 30% of the workforce in its EMEA (Europe, Middle East and Africa) Systems division at the end of the year. The move is part of an organisational shift that will split Discreet into three distinct units covering systems, 3D animation, and desktop video, with all Systems business EMEA operations to be centralised operations in Soho.

The refocusing and associated job losses are in response to what Discreet describes as difficult economic conditions and shifting market dynamics in the systems business, with a level of growth below original forecasts.

Discreet, which publishes *3ds max*, *combustion*, and *cleaner*, is not about to make any price reductions as a response to current trends, says Keith Russell, Discreet EMEA Director – Software.

"In fact, as business is booming, we are in the process of hiring across Europe," he added.
CONTACT: www.discreet.com

NEW HARDWARE

Max Black takes advantage of the latest Intel and NVIDIA technology in its workstations

Leading high-end hardware company Max Black launched its latest range of workstations this month. Dubbed Storm, the PCs use Intel's newest workstation chipsets, which offer performance gains of up to 30% over current workstations.

The Storm 2 range will feature the Intel E7205 chipset, and will offer support for Intel's new Hyperthreaded Pentium 4 processors, clocked at 3.06GHz and higher, along with a 533MHz Front Side Bus and 8X AGP Pro 50 graphics architecture. It will also have integrated six-channel Dolby Digital 5.1 audio.

Max Black reckons that the Storm 3 MPS flagship range will comprise the most powerful content creation workstations available. These will use the Intel E7505 chipset, and offer support for the latest Dual Xeon processors. They will also have integrated FireWire, Ultra SCSI storage, plus three independent PCI-X buses. Both the Storm 2 and Storm 3 are also set to include six USB2 ports and integrated Gigabit Ethernet, with support for Windows 2000, NT, and Red Hat Linux operating systems. On the graphics front, Max Black is to use NVIDIA's latest Quadro 8X family of products.

The increased power and bandwidth of these new Quadro4 cards offer performance improvements of up to 40% for Open GL-based applications. The Quadro4 280 NVS, Quadro4 380 XGL, Quadro4 580 XGL and Quadro4 980 XGL

"THE STORM 3 MPS FLAGSHIP RANGE WILL COMPRISE THE MOST POWERFUL CONTENT CREATION WORKSTATIONS AVAILABLE."

are all available. All the cards feature multi-display technology, dynamically allocated memory, and NVIDIA's Lightspeed Memory Architecture, while the Quadro4 980 XGL is also programmable. Max Black is also offering the cards as upgrade solutions.

Elsewhere in the world of imaging, Matrox Graphics is to introduce its latest Parhelia card. The extra built-in memory of the 256MB Parhelia makes it ideal for dealing with heavy texture data loads, as well as high-resolution multi-head display buffers (Parhelia is the only single AGP triple display solution around). The 256MB Parhelia is available for £449 plus VAT.

Finally, down at the consumer end, Sapphire has introduced a range of cards based on ATI's Radeon chipsets. At entry level there's the 64Mb Radeon 9500 Atlantis and 128MB Radeon 9500 Atlantis Pro, while the 9700 Atlantis is available in 64MB, 128MB, and 128Mb Pro versions. Finally, there's the 9700 Atlantis Pro Ultimate, a fan-free and therefore silent version of the top of the range card spec. Prices TBC.

CONTACT: www.maxblack.co.uk
www.matrox.com
www.sapphiretech.com

Realsoft 3D 4.5 arrives

New features for new platforms in the latest release

Realsoft Graphics has released the latest edition of its modelling, animation, and rendering application, *Realsoft 3D*. The brand, formerly known as *Real 3D* and originally developed for the Amiga, was completely rewritten for the latest release. *Realsoft 3D 4.5* adds substantially to the feature set, not least with subdivision surface modelling, a customisable global illumination system, and high dynamic range mapping. It also supports multi-wavelength raytracing for caustic behaviours and sub-surface scattering for more realistic skin shading. Other additions and improvements include support for rendering time surface displacement, quick shadow map-based lighting, hierarchical sub-image rendering distribution over the Internet, and torsion elimination for skeletal animations. A new tabbed toolbar has also been added to the user interface along with a new context-sensitive help system.

Realsoft 3D v.4.5 is available for Windows and UNIX (Linux and IRIX) operating systems. The Windows version costs $700, while the Linux and IRIX versions are available for just $300. Upgrade discounts and 50% educational discounts are also available. CONTACT: www.realsoft.com

A complete rewrite and a generous discount for Linux users marks the release of *Realsoft 3D 4.5*

Cinema 4D R8 shipping

New modular approach makes package more accessible

Cinema 4D R8, the latest generation of Maxon's high-performance, low-cost modelling, animation, and rendering tool is now shipping. The latest edition boasts literally hundreds of new features and enhancements. More modelling and selection tools have been added, as has a new node editor and F-curve manager, and rendering is now up to 40% faster. Particular attention has also been paid to improving workflow, with better Open GL support and a new Attribute Manager.

With R8, Maxon has also adopted a completely new modular approach, with users able to expand their 3D toolset with extra purchases at a later date. This also means the software is available in its most basic form at a far lower price than previous editions.

Seven modules are initially available: Advanced Render, Pyrocluster, MOCCA (animation and rigging tools), Net Render, Dynamics, and BodyPaint 3D. These can be bought individually, or as part of two bundles. Pricing starts at £390.64, with the XL Bundle at £1,105.53 and the Studio Bundle at £1,658.72. R7 users can upgrade to the latter bundle for £331.06 (all prices exclude VAT). Read the full review on page 76. CONTACT: www.maxon.de

VELLUM RELAUNCH

After a sneak preview at MacExpo 2002 earlier this month, Vellum Software is preparing to release its *Designer Elements* 2D and 3D graphics tools for the Mac OS X platform. As well as catering to the CAD needs of product designers, the range also targets the 3D Web, print, and broadcast markets.

"We have taken our former product line, including *Vellum Solids*, expanded its power and rolled out fresh, superior products, including our new flagship, *Cobalt*," says Ashlar-Vellum president Robert Bou.

The suite encompasses *Graphite*, for professional drafting; *Argon*, for 3D modelling, animation, and rendering; *Xenon*, for industrial design; *Cobalt*, a high-end engineering tool built on the technologies featured in both *Argon* and *Xenon*; and *Neon*, for 3D presentations and Web content. A texture package called *Vellum Materials* is also available (for £75).

The software will retail at £695 for *Graphite*, £695 for *Argon*, £2,195 for *Xenon*, £2,895 for *Cobalt*, and £395 for *Neon* (all prices excluding VAT and delivery).
CONTACT: **www.vellum.co.uk**

Stitcher takes it EZ

Popular image-stitching app gets new entry-level version

The image-processing specialist REALVIZ is targeting graphics enthusiasts with its latest release. As the name suggests, *Stitcher EZ* is an entry-level version of its popular *Stitcher* program, which was originally developed for professional photographers, 3D artists, architects, and multimedia creators, and was most recently used in the creation of films such as *Captain Corelli's Mandolin* and *28 Days Later*. *Stitcher EZ* is designed to place panoramic image creation within the reaches of the new generation of inexperienced digital camera users, enabling them to quickly generate enlarged scenes for printing, creating virtual

tours, or adding to websites. In addition to offering a one-click solution for 360-degree panorama creation, it can also be used to stitch separately scanned elements of large documents back together again.

"We recognise the considerable potential of the digital camera hobbyist, who, despite his relative inexperience in the digital imaging arena, still demands the highest standards in terms of image quality and user friendliness," says REALVIZ President and CEO Dominique Pouliquen.

Stitcher EZ is available for Windows (optimised for Pentium III and above) and Mac OS X platforms for $59 (£59)
CONTACT: **www.realviz.com**

Even inexperienced snappers can capture huge swathes of landscape without loss of resolution with REALVIZ' *Stitcher EZ*, the entry-level version of its popular *Stitcher* image-stitching package

Maya to LightWave
Maya2LW is a utility designed to help *Maya* users looking to port their animations over to Newtek's *LightWave 3D*. It's available free of charge, courtesy of Marcus Weiland, a programmer and artist based in Germany.
www.3danim.de

Vicon on track
Motion-capture company Vicon has launched *Vicon iQ*, a software solution to streamline motion-capture workflow and increase tracking accuracy when capturing extreme movements of multiple characters, with real-time streamlining and raw data storage, plus a set of tools that automatically remove the need for step-by-step editing. The software will be supplied with all-new Vicon system sales.
www.vicon.com

Quest3D gets physical
Dutch software company Act-3D has released a new version of its *Quest3D* multimedia production and game development software. *Quest3D 1.3* adds physics simulation, video integration, and support for models created in *AutoCAD*, *3ds max*, and *Maya*. The retail prices remain the same, at $89 for non-commercial use, $749 for professional users, and $1,999 for the Enterprise Edition.
www.quest3d.com

750MB Zips
The new USB2/FireWire Iomega Zip 750MB drive triples the capacity and doubles the maximum transfer rate of the popular Zip 250MB drive. The drive itself costs £169.99, and discs cost £34.99 for a three-pack. An internal version of the drive is also available.
www.iomega.com

NEW MULE UNLEASHED

Following the opening of its UK sales and support office, The Electronic Farm is now shipping *Mule 2.2*, the latest edition of its non-linear editing and effects software.

Mule 2.2 includes real-time HD/SD capture and playback, and a Fast Colour Corrector with both standard and telecine-style interfaces for multi-scene timeline grading, while its Mulescope component offers Vectorscope feedback of all applied colour controls. Also included is a new VFX module, with Primatte keyer, more than 35 filters, tracking and stabilising, animation graphs, and VFX timeline views. The software also supports videotape archiving, with the ability to include project settings.

A complete SD Turnkey solution operating on an SGI Fuel system, with six hours of uncompressed FC Raid storage is available for €60,000. An HD Turnkey Octane 2 solution with eight hours of storage is available for €130,000. The Electronic Farm is currently planning presentations in the UK, Germany, Hungary, and Spain.
CONTACT: **www.electronicfarm.com**

DISCREET CLEANS OUT MAC

Discreet has begun shipping *Cleaner 6*, its professional video encoding application, for the Mac. The recipient of Macworld's 'Best In Show' award at its unveiling, this latest edition includes support for MPEG4 and AAC audio compression through Apple's own *QuickTime 6* format, plus two-pass variable bit rate encoding for MPEG2 for high-quality DVD creation, as well as support for RealMedia and Windows Media. In addition to highlighting *Cleaner 6*'s Web and multimedia-friendly features, Discreet is also pushing the program as a PDA content-creation tool, through its support of the Kinoma file format. Other notable features of the new version are drag-and-drop encoding, 150 presets, and a new Watch Folders element.

Cleaner 6 for the Mac is available for £470 ($750), with an upgrade option available for just £140 ($220).

First class delivery

MPC's Royal Mail ad features Fight Club camera techniques

Moving Picture Company delivered a great package for its latest Royal Mail ad

Swooping camerawork is the signature element in *Reveal*, the latest ad from Paul Street, director of the 'Steve McQueen' Ford Puma spot. The seamless shots in his new Royal Mail ad were made possible by extensive 3D work from The Moving Picture Company. Opening with an aerial shot of a city, the viewpoint rapidly moves down to street level and right through the first of several Royal Mail vans, with the ad then following various packages in each van to their destinations.

The camera techniques were inspired by those used in David Fincher's movies *Fight Club* and *Panic Room*, with the viewpoint gliding through confined spaces a real camera would never reach. Extensive previz work was necessary, with MPC mapping out the entire 40-second ad – including all live elements – on *Maya*, thus enabling the crew to block every shot and drop in reference footage on set.

Eight days were spent on live shoots in Cape Town, London and Shepperton, where vehicle interiors and models were shot with motion control. Set extensions, including the remaining half of a cut-away van interior, were created in *Maya*. *Entropy* was used for additional rendering passes and *Boujou* handled the 3D tracking.

The ad required extensive compositing, and lead *inferno* artist Alex Lovejoy attended shoots alongside the 3D artists, then blended and stabilised all the disparate camera moves into one continuous movement. Colourist Jean-Clement Soret added the final organic grading, reflecting the director's desire to steer away from a typical metallic sheen. The ad was one of MPC's most ambitious commercial projects yet, taking almost four months from initial meetings to final delivery. It's currently airing on all major commercial UK channels. CONTACT: **www.moving-picture.com**

Cat converter

Glassworks uses moggy innards in Merc ad

After much success with its hula hooping mice, Glassworks has applied its animalistic talents to the creation of a CG cat in an ad spot for Mercedes. The commercial demonstrates the safety features of the S Class using a slow-motion shot of a cat falling upside down and twisting to land on its feet, with the live footage dissolving to a circling X-ray view midway through the scene. As the cat falls and twists, the camera rotates around to show its muscle and skeletal movement from every angle. Once it lands safely, the camera pull switches the focus to an X-ray style view of the Mercedes, revealing the vehicle's interior safety system.

Starting with footage of a real cat shot against green screen, and slowed from 1,000 to 2,000fps using a Kodak Cineon system, Glassworks then built a 3D match of the creature in *Softimage|XSI*, modelling organs, skeleton, muscles and tendons. A 3D X-ray model of the Mercedes was also constructed, along with X-ray plates and digital photos of buildings to provide a background for the descent. In total six weeks were spent modelling, compositing and grading the spot. The commercial will air globally, kicking off with a launch in Germany. CONTACT: **www.glassworks.co.uk**

CRACKING IDENTS

Welsh TV channel S4C has switched to CG-based branding, with a set of new idents created by SI Design, a division of Television Services International. The idents refer to the station branding of the last five years, but also symbolise the 'Welshness' of the channel through colouring and imagery.

TSI handled all live action work, design and direction, as well as the *3ds max*-generated 3D elements. The CG was used to give life and personality to a number of everyday objects. One ad features a CG egg on a conveyor belt, which begins to tremble and crack, before smoke curls out, referencing the bright red S4C logo. The four idents, ranging from five to twenty seconds in duration, are currently airing. CONTACT: **www.s4c.co.uk**

Wild at heart

Creatures from the Ice Age resurrected for BBC show

Wild New World is the latest TV programme to dip into the past with the help of computer-generated creatures. Created by BBC MediaArc Bristol for the broadcaster's History Unit, the six-part series focuses attention on the Ice Age, resurrecting some of the creatures from 13,000 years ago, and in certain scenes transplanting the ancient animals into latter day New York.

The programme has been in development for more than two years, with a team of fourteen artists and animators working on nine different species, including the Woolly Mammoth, Sabre Tooth Tiger and Short Faced Bear. In time-honoured fashion the artists have based their designs on expert input from a team of scientists (who specified every detail, right down to length of fur on a chin). This invaluable information was then used to develop the NURBS-based 3D models, with documentary footage of contemporary animal behaviour providing the remaining cues for rigging and final animation.

Maya 4.0 was the primary 3D tool, with the team also using its fur simulation system for the manes and coats of the various creatures. *Fire* was used to add a number of effects, with *Boujou* utilised for matching camera tracking and helicopter shots. In addition to the animal work, the team also created sequences showing a view of the Earth from outer space to show the climatic changes taking place.

The series is currently being screened on BBC1 and Discovery. A *Wild New World* book is also available. CONTACT: **www.bbc.co.uk/nature/programmes/tv/wildnewworld**

The BT ad's showstopper, a fearsomely huge, but ultimately benign and slightly goofy three headed dragon. "We took texture inspiration from crocodiles and other lizards at London Zoo," says 3D producer Stephen Venning. "One of our artists then painstakingly worked through it, painting up all the individual areas of the creature."

The ad uses a smart blend of live and CG effects to depict the broadband chaos. For the rhino landing sequence, a real jeep is crushed using a two-and-a-half tonne metal rhino. The CG rhino is then carefully comped in, sitting seamlessly in the remains of the live jeep.

DETAILS

Title BT 'Burst Pipe' broadband ad spot
Agency St Luke's
Director Garth Jennings
Running Time Various, up to two minutes
First Broadcast September 22nd, 2002
Where Terrestrial and digital TV
Production Hammer & Tongs
Post Production Mill 3D
URL www.mill.co.uk and www.beam.tv/beamreels/beamreel.php?mpmnbdei
Team size on project 22
Time taken to complete project Ten weeks per ad spot
Software used Maya, XSI, RealFlow, 3D-Equalizer, Boujou, Deep Paint, flame

THE BT 'BURST PIPE'
BROADBAND AD

Take a rhinoceros, add a Hurricane, two game characters and a three-headed dragon, and you've got a spectacular ad campaign for high-speed Net access **BY MARK RAMSHAW**

British Telecom may well be drawing fire for its slow broadband rollout, but the telecommunications company has certainly shown willing when it comes to publicising the service, creating the most intensive (and probably expensive) UK ad campaign ever. At the centre of its new $33 million campaign (with £1 million spent every day of an initial ten-day blitz) is a stunning blend of live action and CG, created by production company Hammer & Tongs and The Mill.

"We hadn't worked with Hammer & Tongs before, but the agency involved [St Luke's] had seen a few ad spots that showed our effects work and so got in touch to test the water before they commissioned a storyboard," says The Mill's 3D producer Stephen Venning. "Hammer & Tongs seem to have a very good understanding of CG. They know how to do stuff in camera that helps it to sit in the scene better, and they realise that CG is only part of the solution."

The final ad comes in several versions, including a two-minute edition for use in cinemas. "The original idea was to have the longest at 90 seconds, but they had so much good footage and thought a longer one would be great. It does tell the story better, and while it required extra work, it wasn't too bad, given that we'd already built the models." With its running time, big broadcast budget, and wide range of digital effects, Venning likens the ad to a short film. "It certainly felt like that in terms of the five-month schedule instead of a six-week turnaround, and with people doing dedicated tracking, modelling, and so on. It was probably the biggest team we've ever had on a commercial. But it was a good one to work on, and I do think a blockbuster like this is good for the whole industry. Hopefully, it will inspire other agencies to use (creatively led) digital effects to create work with a similar buzz."

More about The Mill at www.mill.co.uk. See the advert at www.beam.tv/beamreels/beamreel.php?mpmnbdei

9 And here's the model again, this time comped with overcast sky. "On the day of the live shoot there was a really strong blue sky, with a low sun casting harsh shadows, whereas the commercial was intended to look overcast without strong shadowing," explains Venning. "In the end we put shadows back in, which really helped the model blend in. A lot of passes were eventually rendered out to give it the right look, including reflection, chrome, and beauty passes."
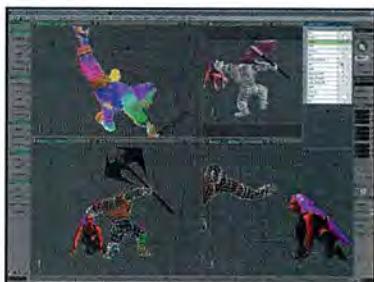
10 For the scene in which videogame characters battle it out at Victoria Station, two polygonal warriors were designed in the style of best-selling beat'-em-up Tekken. "The animator originally worked on videogames, so he was very good at giving them that superhuman animation style. It's quite tricky to do. A rhino is a rhino, but here you're trying to capture the feel of something that isn't real."
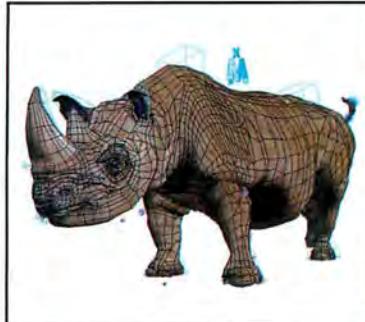
1 "The starting point was a bought-in rhino model. We then had a series of presentations with the director and agency to establish the final shape," explains The Mill's Stephen Venning. "They wanted it to look quite heavy, with a large backside, so we eventually came up with this, a model shape that everyone liked."

5 A real car was crushed for the falling rhino shot, with a two-and-a-half tonne metal rhino dropped on the jeep. The CG rhino was then composited over the metal one. "It crushed the car really well, giving us indentations that were perfect for placing the CG rhino. Although it had to be as realistic as possible, they didn't want the animal to look in distress or pain. It clocks the camera, blinks, and then runs off with a bit of rhino arrogance."
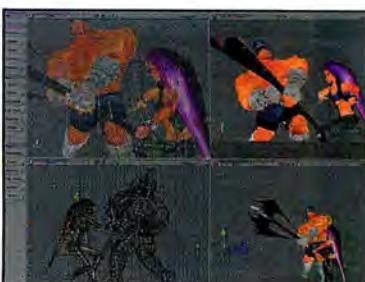

11 "In terms of the modelling and texturing, they are probably not as modern as the sort of things in contemporary games for consoles such as the PlayStation 2, but there's a need to have them look very obviously like general videogame characters," says Venning. "Using flame we were then able to make them slightly translucent, giving them a game resolution sort of look."

2 Here's the rhino model with texturing added. "We went off to London Zoo with a camera and macro lens and took shots of their rhino, a skinny, old one about half the size of ours, from every angle for texture reference," says Venning. The digital stills were then manipulated to use as a texture base, with the final effect achieved using a combination of *Photoshop* and *Deep Paint* work.

3 "A lot of time was spent rigging the rhino, looking at the joints and muscles work, and ensuring that the skin would behave realistically," explains Venning. "The internal skeleton and muscles were built as accurately as possible. With a job like this the trick is to keep everyone excited. You achieve a lot quite quickly, but the stage where you're adding subtleties and nuances takes a lot of time."

4 In the ad, the rhino falls from the sky onto a Suzuki jeep, then runs off. "We coincidentally saw a documentary on rhinos just as we began considering the animation," says Venning. "We then got some other taped material in, and the rhino animator spent time on his holiday in South Africa to go on safari to check out rhinos first hand. It might seem over the top, but it all helps."
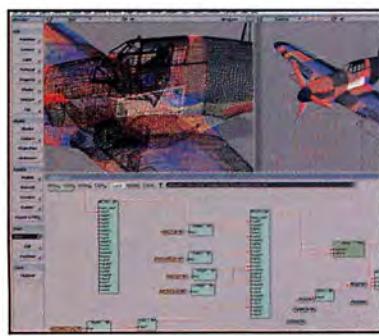
6 With the original Spitfire idea ditched in favour of the better-looking Hawker Hurricane, a bought-in 3D model provided the starting point. "That gave us the basic shape, and then the director had ideas about how it should look. One reference point was *Pearl Harbour*. The idea was to have it very matt, very photoreal."

7 While the rhino was put together in *Maya*, the aircraft CG was created using *Softimage|XSI*. "In terms of kit choice, it was really down to the available talent. We needed to bring in specialised freelancers and so simply let them work with the package they could get the results with. We try not to be too kit-specific."

8 This is a still of the fully textured Hurricane model. History books and the Internet provided pictorial reference for the texture work. "We also took trips to museums, taking photos to examine how the textures of metal on real planes appears," says Venning. "These were just used for visual reference, rather than a physical basis for the textures (as with the rhino)."

The ad brings digital content into a real-world setting to illustrate the power of a high-speed Internet connection. It opens with a BT cable-laying team interrupted by a vortex (created using *RealFlow*). This splits the broadband pipe, unleashing all manner of online oddities into the suburbs. A rhino falls from the sky, a Hurricane zooms past a street market, a space shuttle flies across the sky, and videogame beat-'em-up characters fight at Victoria Station. The BT engineer works his way through it all, herding the escapees back into the pipe, finally ushering a benign three-headed dragon back to its natural habitat.

12 Here are the shimmering videogame characters, seamlessly integrated into the live plate, extensively previsualised and then shot during a busy four-hour *period* at the railway station. "We had to work with a lot of hand-held shots. This shot where they walk away looks so simple, but was one of the trickiest. People were walking right across the path, so a clean background had to be painted in."

13 As with the rhino, the dragon that appears at the close of the ad was modelled and animated in *Maya*. "On paper it's fairly easy to design a classic dragon, but once you do it in 3D you discover problems, like the fact that legs don't work properly. There was a lot of finessing so that he could stand and walk properly. We also looked at the head design. We were encouraged to make him goofy and friendly."

14 The dragon is never seen in its entirety so the artists could focus on the key areas of the foot, tail, and the upper half of the three-headed body. In terms of creature animation, there's an almost Ray Harryhausen-esque element creeping into the performance. "Because it's a short ad you don't have the time for a slow-moving creature, so he's animated very quickly," agrees Venning.

VIEWPOINT

Jason Busby

TITLE OWNER
COMPANY 3D BUZZ
WEB WWW.3DBUZZ.COM

Modern-day philanthropist Jason Busby has dedicated the best part of a year to providing high-quality 3D video training to thousands for free. 3D World asked him why…

Today I woke up early, started the coffee, and began downloading email. As I sifted through the 300-odd new messages sent during the night, I stumbled across yet another version of a simple question I'm routinely asked, this time by a young man from Indonesia. He wants to know why I do what I do. This is the single most asked question I receive. Let me see if I can shed a little light on what I am talking about.

As the Director of Animation at the Renaissance Center and certified instructor for Discreet, Alias|Wavefront, and Softimage, I know first-hand how expensive 3D animation training can be. As the CEO of a non-profit organisation, I am able to provide professional training at very low rates. But even then, the cost of talented instructors, equipment, courseware and so on keeps the training out of reach for many. If you've ever researched the cost of professional 3D training, I'm sure you'll agree.

Cost is not the only thing that keeps individuals from this type of training. What about those that can't travel because of their jobs, commitments, or age? Many people are left with the challenge of learning via online tutorials or books. For some, this works well, but many others are left frustrated.

Then, one night, I had a vision… well, sort of. What if I produced and distributed training videos free of charge? I could start at a beginner level and work my way up. If people followed along, it would be as if they were involved in some type of virtual classroom. By keeping it free, anyone interested in learning 3D would now have an opportunity. This was the birth of the Video Training Magazine, or what has simply become known as the VTM.

So who would pay for such an undertaking? Well, to start with: me. The idea was simple. If only a handful of people were interested, I'd be able to cover costs indefinitely. But, if we were to have a large influx of people, then the goal would be to get sponsors to help offset the cost. With the attention of thousands of VTM students, companies could effectively market their products. In essence, these companies would be supporting the education of thousands. Today, we have over 31,000 subscribers to the VTMs, and the number continues to climb.

So, what's in store for the future of 3D Buzz? Well, I will continue with the production/distribution of the VTMs with the content becoming more complex with each issue. Imagine learning how to write a distributed rendering engine for *Maya* or develop sophisticated plugins for *3ds max*. These are just two of the things to come. In December, we'll offer our first online course to go hand-in-hand with the VTMs. The specific software will be *Houdini*, and Side Effects Software will sponsor the program. The cost is free, of course. Students can expect homework assignments, tests, modelling, and animation projects.

Before I stand down from my soap box, I'd like to take a second to thank Angela, Logan, and the rest of the 3D Buzz crew for all of their hard work and sustained efforts. Without them, 3D Buzz would have remained only a vision. Oh, and the answer to that question: why? I think life's too short to do anything other than what makes you happy, and for me, it's helping others achieve their dreams. I can't think of a better way to accomplish this than to provide free education. ■

Jason Busby is the Director of Animation at The Renaissance Center. In his spare time, you can find him maintaining his education-driven website, 3D Buzz

NEW TECHNIQUES IN
3D LIGHTING & RENDERING

A whole new generation of lighting and rendering techniques have now arrived. If you haven't yet familiarised yourself with them, it's probably about time you did… **BY JEREMY BIRN**

For the past 15 years, almost all 3D graphics in feature films have been created using the same lighting techniques – shots have been lit with spot lights casting depth-mapped shadows, and rendered without any software simulation of indirect or bounced light. But a lot of other things have moved on during that period – simple figures, such as the tentacle of water in *The Abyss* `(featured in this month's Key Frames, page 98), have been replaced by extremely realistic creatures, such as the fire-breathing dragons in *Reign of Fire*. Animated characters have moved from the simple metal and plastic figures of Pixar's *Tin Toy* to the plush, naturally shaded fur of *Monsters, Inc.*

When devoting resources to so many challenges, core lighting and rendering techniques have tended to be kept simple. Most feature films are rendered without raytracing, and without Global Illumination. Lighting techniques have been chosen based on efficiency in large complex scenes, instead of always using the latest, most powerful, or most eye-catching algorithms.

Now, with faster processors and new software becoming available, the industry seems to be turning a corner, and new lighting techniques are coming into widespread use. This year, Pixar's *PhotoRealistic RenderMan* (www.pixar.com/renderman), the most widely used renderer for feature film production, is being released at version 11: the first to support raytracing and Global Illumination. This year's release 5 of *3ds max* (www.discreet.com) supports radiosity, and has a host of optional renderers that offer more advanced rendering features. *LightWave 3D 7.5* (www.newtek.com) has added multiple-bounce radiosity to simulate indirect light. And the third-party renderer *mental ray* (www.mental.com), which has offered many of these features for years, is becoming more popular than ever in film production, even being offered to *Maya 4.5* users (www.aliaswavefront.com) for free (see news, page 10).

With all these new software options, and hardware fast enough to enjoy them, it's time for 3D artists to bone up on the hottest buzzwords in today's 3D rendering: High Dynamic Range Images, Image Based Lighting, Colour Bleeding, Caustics, Photon Mapping, Barrel Distortion, Chromatic Aberration, and Bokeh Effects. If you don't know about this stuff yet, keep reading – because you'll certainly need to in the very near future. **>>**

HDRI

A High Dynamic Range Image (HDRI) is an image file that's capable of storing more exposure information than is visible within the displayed image. The extra information gives you more manipulation flexibility

A n ordinary 24-bit colour image, whether it's a 3D rendering or a digital photograph, stores a limited range of tones from dark to light. Any part of the image that's too bright is overexposed, and represented as pure white. Once the tones are clipped to pure white, there is no recoverable detail in that area of the image, because all the pixels have the same colour value. A similar process of clipping happens on areas of the image that are underexposed.

Areas of an image getting clipped into white or black become a serious problem in computer graphics because adjustments cannot subsequently be made. For example, imagine that a sunbeam is casting a bright pool of light onto the floor of a room. If it's bright enough, it might get clipped to pure white when the shot is digitised. This may not seem like a problem, but to a visual effects artist, it could be a nightmare to composite a 3D figure into that room with a realistic shadow blocking part of the

BELOW **If a scene is rendered to a High Dynamic Range Image file, it's possible to display the image at different exposures without re-lighting and re-rendering the entire job**

sunbeam. Starting with a clipped image, there would be no way to recover the texture of the floor in that area. And where the white sunbeam was darkened, it would only appear as a flat gray. If instead the film had been scanned into an HDRI file, it's possible that there would be more information to work with, enabling the lighting to be more adjustable, even within bright areas of the image.

Renderers that support HDRI output, such as *LightWave 3D* and *mental ray*, can produce files that contain data about tones much brighter or darker than are visible on the screen. This opens up a whole world of new image manipulation options. Instead of colour values getting clipped into a range of 0-255, full floating-point values are stored for each colour channel. HDRI files can then be manipulated in a program such as *Photogenics HDR* (www.idruna.com) or any compositing program that supports full floating-point colour data. With HDRI, the exposure of a scene can be adjusted to your heart's content after rendering, without having to re-render.

IMAGE BASED LIGHTING

In addition to allowing for a broader range of image processing options, HDRI files can also be used in some programs, such as *LightWave 3D* or *mental ray*, for Image Based Lighting (IBL). IBL is a process that essentially surrounds a scene with a giant sphere, and projects an image inwards from the sphere, so the colours and tones in the image are added as light to the scene. And IBL works best with HDR images.

To produce HDRI of the environment around a real scene, a camera is focused on a reflective chrome sphere, and a series of pictures taken at different exposures to capture everything from the brightest to the darkest detail in the scene. The whole series is then put together into one HDRI file using *HDR Shop* (www.debevec.org/HDRShop).

IBL is also sometimes used without shadows, in which case it can serve as an extra source of ambient light that picks up colours from an environment map.

Even though many studios haven't started making regular use of HDRI yet, it seems clear that within a few years almost everyone will. HDRI files have many advantages over RGB images, and the only drawback is that they take up a little more space on a hard drive.

Colour bleeding

Colour bleeding is a phenomenon that is present all the time, yet we often only notice its presence subconsciously. Only when it's absent do we sense that something's not quite right…

Colour bleeding is the natural transfer of colour between objects that are near to each other, due to the fact that light has bounced off one surface to indirectly illuminate the other. If you put a red ball down on a white beach blanket, you'd expect to see a bit of a red glow, carried by the indirect light, colouring parts of the beach blanket. There are two ways to add colour bleeding to scenes:

1. Use a renderer with Radiosity or Global Illumination capabilities. More and more of today's renderers support these features, which can accurately simulate indirect light bounces and colour bleeding. Working this way, scenes might take longer to render… but it's often worth the wait.

BELOW **Working without Global Illumination, I simply added a few coloured lights to create the red glow underneath this ant – it's a simple trick, but adding colour bleeding where it's expected can greatly enrich a rendering**

>> WHAT'S THE STORY?

PROS

>> **Makes images more realistic**

>> **Adds variety to the shading of otherwise blank surfaces such as white walls**

>> **Adds a visual cue to show when two surfaces are close together or touching**

CONS

>> **Can take much longer to render**

>> **Interferes with the purity of colour schemes for stylised animation**

>> **In composited visual effects shots, does not take into account live-action plates, miniatures, or matte paintings – which will be in the final shot but are not present in the 3D scene**

FACT FILE

DEVELOPMENT
>> The first colour image produced based on mathematically simulated reflection of light between coloured surfaces was created by Parry Moon and Domina Eberle Spencer at MIT in 1948. Cindy Goral of Cornell University created the first 3D rendering that simulated colour bleeding in 1984. Since then many researchers have furthered the simulation of colour bleeding, but credit as The Father of Radiosity goes to Dr Donald P Greenberg, Professor of Computer Graphics and Director of the Computer Graphics program at Cornell University, where he has led research on radiosity for over two decades

MAIN USES
>> Colour Bleeding creates the impression in renderings that light has diffusely bounced between coloured surfaces

PACKAGES CURRENTLY SUPPORTING THE EFFECT
>> *Strata Studio*
>> *LightWave 3D*
>> *3ds max*
>> *SoftimageXSI*
>> *mental ray*

ESTIMATED TIME UNTIL UNIVERSAL ACCEPTANCE
>> Colour bleeding will never become universal because it is not appropriate for every image. Even in visual effects work where realism is a high priority, some VFX elements rendered in isolation might benefit more from HDRI Image Based Lighting than a simulation of colour bleeding

ON THE WEB
>> www.graphics.cornell.edu /siggraph/1998images.html
For a history of the development of radiosity and other techniques

>> graphics.stanford.edu/~ henrik
Henrik Wann Jensen's Photon Mapping approach is an alternative way to render colour bleeding. It has advantages over conventional radiosity in that the calculation of indirect light is stored independently from the scene's geometry

ABOVE **The idea of colour bleeding is that in scenes with Radiosity or Global Illumination the hue from coloured objects naturally spreads onto other nearby surfaces**

2. Fake it! This is how most professionals work today. If you spot an area in your 3D scene that would benefit from colour bleeding, just add a coloured light to the area of your scene that needs the coloured illumination.

In the beach ball example, a small point light or omni-directional light could be added above the blanket and set to decay rapidly so that it only illuminates the local area. The light doesn't need to cast shadows, so it could shine right through to the outside of the ball if placed in the middle of it. But how do we pick the right colour for the light?

CHOOSING THE COLOUR

When light reflects off a coloured surface, the light colour and the surface colour are multiplied together. For example, if the sunlight hitting the beach ball had an RGB value of [0.9, 0.8, 0.7] and the surface of the beach ball had an RGB value of [0.95, 0.20, 0.25], then the colour of the reflected light would be:

R: 0.9 X 0.95 = 0.855
G: 0.8 X 0.20 = 0.160
B: 0.7 X 0.25 = 0.175

The resulting RGB colour of the reflected light, [0.855, 0.160, 0.175], would be what appears in your renderer's diffuse shading of the ball's surface. It should also be used as the colour of the indirect illumination that bounces onto the beach blanket.

Because the RGB values that are multiplied together are fractions between 0 and 1, the red, green, and blue colour values always decrease each time light bounces off a surface. You may be tempted to sometimes raise one, as if the light had 'picked up' an extra colour, but this is not realistic. For example, a pure blue light reflecting off a pure red surface should lose its brightness instead of turning red or purple, because the value of the red channel cannot go higher than it was in the original illumination. >>

Rendering caustics

Similar in some ways to colour bleeding, caustics describe light effects that occur when light is reflected in a more focused manner, such as from the surface of a mirror or body of water

PROS

>> **Adds realism to scenes with metal, glass, or water**

>> **Brightens dark areas in shadows of glass**

CONS

>> **Adds to rendering time**

>> **Can appear blotchy if not rendered accurately enough**

ABOVE **Caustic effects are capable of creating interesting patterns such as these when light bounces off water**

G lobal Illumination is a broad category of effects that simulate different kinds of indirect lighting. Colour Bleeding is one effect of Global Illumination; it comes from the diffuse (or scattered) light reflected from surfaces. Caustics are another kind of Global Illumination; they simulate specular or glossy light reflection, light that remains relatively focused when it bounces, instead of diffusing in all directions. Any time you have indirect light that keeps a shape or pattern, instead of being scattered diffusely, you encounter Caustic effects. Here are some examples of Caustic light effects:

• Light reflected from a rectangular mirror that throws a rectangle of reflected light onto the floor
• Light refracted through a glass that casts a pattern on the table beneath it
• Light that is concentrated or focused by passing through a lens or being reflected off a curved surface
• Shimmering light that reflects or refracts off water
• Glints of light visible near shiny metal objects
• The pattern visible in a flashlight's beam due to the shape of its reflector

Many of these effects can be simulated without true Caustic rendering. For example, you can apply a colour map to a spot light to simulate the pattern in a flashlight beam, or a fractal noise texture could be applied to a light to simulate shimmering light reflected off water.

BELOW **Caustic effects enable the renderer to simulate the rectangle of light reflected onto the floor from the surface of the mirror**

FACT FILE

DEVELOPMENT
>> Henrik Wann Jensen's paper Rendering Caustics on Non-Lambertian Surface was published in *Computer Graphics Forum* in 1997. He was also the inventor of Photon Mapping and one of the most popular ways for a renderer to simulate Caustics

MAIN USES
>> Caustics can simulate glints of light focused through glass or lenses, and reflecting off metal, mirrors, or water

PACKAGES CURRENTLY SUPPORTING THE EFFECT
>> *LightWave 3D*
>> *Cinema 4D*
>> *Maya* (with downloadable plugin)
>> *Brazil*
>> *finalRender*
>> *SoftimageIXSI*
>> *mental ray*
>> Coming in v11 to Pixar's *PhotoRealistic Renderman*

ESTIMATED TIME UNTIL UNIVERSAL ACCEPTANCE
>> This year. Support for Caustics rendering is becoming a feature in the majority of high-end renderers

ON THE WEB
>> http://graphics.stanford.edu /~henrik
The homepage of Stanford University researcher Henrik Wann Jensen, inventor of Photon Maps. This wonderful site has more examples of Caustic rendering, as well as other innovative uses for Photon Maps in calculating full Global Illumination, illumination with diffuse colour bleeding, and 'sub-surface scattering' for realistic translucency on materials such as human skin, marble and wax

PHOTON MAPS

True Caustic rendering is usually calculated with the help of Photon Maps, which were invented by Henrik Wann Jensen, and first documented, along with their use in Caustic rendering, in papers he published in 1996. (See the Fact File for his URL.)

Ordinary rendering and raytracing works 'backwards' – the rays start at the camera, and the whole scene is scanned from the camera's point of view. Where the camera sees a reflective or refractive object, the ray that started at the camera may bounce in another direction, eventually reaching another object visible in the reflection. When an object is lit by a shadow-casting light, rays are traced towards the light to check for any occluding objects that might shadow a part of the surface being rendered.

Photon Maps are special in that they run 'forwards' instead of backwards, starting at the light source – just like real light. Photon Mapping simulates a finite number of photons emitted from the light source, then bouncing off reflective or shiny surfaces, or getting focused through transparent materials, and eventually reaching a surface which they can brighten with the resulting Caustic effects.

In real life, photons are very, very small. In order to keep rendering times down, the particles used in Photon Mapping are much bigger than real photons, which can sometimes lead to a blotchy appearance in your rendering. The blotchiness can be reduced by using a more accurate computation with more, smaller particles, although this slows down your rendering. If the light or the reflective objects are not moving, then Photon Maps can be stored and re-used in multiple frames, saving rendering time. See the Fact File for a list of renderers that support Caustics.

Realistic lens effects

Straight lines usually appear distorted in real photography and film because of lens diffraction. Realistic Camera Lens functions mimic this action by give your rendered edges a fake bend

ABOVE **Before Lens Distortion. The original rendering appears unnatural without lens distortion a all the lines are perfectly straight**

BELOW **With Lens Distortion, straight lines in this scene appear curved due to barrel distortion, and some edges have chromatic aberrations**

Straight edges captured in real photos usually don't appear perfectly straight. This is especially true in images shot with a wide-angle or fish-eye lens (lenses with a small focal length and a wide field of view). Wider angle images get warped in a manner called 'barrel distortion', in which the centre of the image is warped outwards and the edges and corners are compressed. This can turn straight lines, such as the walls of a room, into curves in your photograph.

On many zoom lenses, barrel distortion appears at the wide angle extreme of the zoom range, and is replaced by the opposite problem – pincushion distortion – when zoomed in for a telephoto shot.

In 3D renderings, you normally get no barrel or pincushion distortion, and straight lines are drawn perfectly straight in your final rendering. Lines like this betray your image as computer-generated, especially in scenes that have a wide angle of view.

If you work in visual effects and want to combine your 3D renderings with live-action background plates, matching real lens distortion becomes an even more pressing issue. Motion tracking software that matches real camera moves in 3D space, such as *3D-Equalizer* (www.3dequalizer.com), include image processing functions to match or correct lens distortion.

Some renderers support programmable camera shaders that enable you to render an image with distortion, such as *mental ray* when used with the RealLens camera shader. With any renderer, however, it's possible to render an undistorted image, and warp it later as a 2D effect. You can download a set of *Photoshop* actions that simulate barrel distortion (from www.3dRender.com/light/lens.htm) and try them out on your own renderings. In addition to

FACT FILE

DEVELOPMENT
>> Paul Bourke of Swinburne University of Technology published his paper *Computer Generated Camera Projections and Lens Distortion* in 1992

MAIN USES
>> Realistic Lens Distortion simulates how the optics of a camera lens distort an image, an effect that's especially visible in the barrel distortion and fish-eye distortion seen at wider angles of view

PACKAGES CURRENTLY SUPPORTING THE EFFECT
>> Any renderer – if you warp images as a post process
>> *LightWave 3D* (image warping plugin available)
>> *mental ray* (with RealLens camera shader)
>> *POV-Ray*

ESTIMATED TIME UNTIL UNIVERSAL ACCEPTANCE
>> It seems that it will be at least 10–20 years before most animation software fully integrates realistic lens models into its camera perspective

ON THE WEB
>> www.3dRender.com/ light/lens.htm
Download free *Photoshop* actions to warp your renderings with realistic barrel distortion and chromatic aberration

>> http://web.mit.edu/sirkin /www/paper
A paper on extending a renderer to use a physically based camera model, including focus, depth of field, barrel distortion, aperture, and exposure

>> astronomy.swin.edu.au/~ pbourke/projection/ lensdistortion
Paul Bourke illustrates computer generated camera projections and lens distortion

barrel distortion, these actions simulate a related effect called Chromatic Aberration.

CHROMATIC ABERRATION

Chromatic Aberration is an artifact you see in some photographs. It appears in the form of coloured fringes around bright lines or high-contrast edges. Chromatic Aberrations are created because different wavelengths of light refract at different angles, causing colours to separate and focus differently when they refract through a glass lens. This is the basic principle behind a prism.

The effect seems useful in a prism, but has been a bête noire of camera lens designers for generations. Good design and carefully chosen materials virtually eliminate Chromatic Aberration in the finest grades of lenses, so it is most often seen in cameras with cheaper optics, or in wide angle lenses which cause the most refraction.

Chromatic Aberration is a closely related artifact to lens distortion, because it causes your red, green and blue channels to each receive slightly different amounts of barrel distortion. While 3D renderers don't render with Chromatic Aberration, to simulate the effect in image processing all you need do is warp your red, green, and blue channels separately, giving the red channel a little bit more barrel distortion, and the green and blue progressively less.

>>

>> WHAT'S THE STORY?

PROS

>> Assists in matching graphics with filmed background images for visual effects

>> Creates more realistic 3D renderings

CONS

>> Will not correctly preview a warped image in wireframe and perspective, making it hard to compose shots

>> Limited software support forces warping at post, requiring an extra step that could reduce image quality

Bokeh effects

It's not an easy effect to describe, but Bokeh defines those out-of-focus areas of an image where points of high light intensity can, on occasion, bloom into larger, fuzzy blobs of light

PROS
>> Correct Bokeh leads to much more realistic depth of field effects
>> Glistening highlights and beads of light in soft focus are very pretty and appropriate, even for more stylised renderings

CONS
>> Very few programs support realistic Bokeh effects
>> Faking Bokeh in compositing programs can be time consuming

okeh (pronounced BO-KEH) is, in fact, a Japanese word that means 'out of focus'. The word made its first appearance in the English language in 1997, when *Photo Techniques* magazine ran a series of articles on the phenomenon. (In Japanese, the word is actually written 'Boke'; the 'h' was affixed in English so that American readers would not think it rhymed with 'Coke'.) And the interest came about because Japanese lens designers had been studying the qualities of the 'out of focus' areas, or Bokeh, of different lenses in an attempt to better understand some of the effects found therein.

In real life, highlights that fall out of focus can bloom into larger blobs, depending on their brightness. Small city lights in a soft-focused background can turn into glistening beads of light as they travel through a lens. Different lenses record these differently (they each have different Bokeh) and create different Bokeh effects at different F-stops.

Depending on the construction of a lens, some Bokeh effects form rings around a highlight, being darker in the centre than around the edges. Some Bokeh are asymmetrical or stretched more in a horizontal or vertical direction. In many cameras, a hexagonal or octagonal shape is created by the metal blades that open or close to change the size of the aperture, and this shape sometimes appears in the Bokeh effects. And sometimes these hexagons appear to have crisp edges, even amid the most blurry part of a photograph.

BELOW **This scene was rendered with a flat DOF effect and post processed to add Bokeh in compositing**

FACT FILE

DEVELOPMENT
>> Juan Buhler and Daniel Wexler of PDI/DreamWorks demonstrated a renderer that simulates Bokeh effects in its depth of Field rendering at the SIGGRAPH 2002 conference

MAIN USES
>> Bokeh Effects simulate how the optics of a camera lens create blooms and glistening beads of light

PACKAGES CURRENTLY SUPPORTING THE EFFECT
>> *Brazil*

ESTIMATED TIME UNTIL UNIVERSAL ACCEPTANCE
>> Probably within the next ten years, all advanced renderers that support depth of field and variable focus will add support for realistic Bokeh. Once people start rendering in HDRI formats, it will also become easier to add realistic Bokeh as a post process based on highlight brightness

ON THE WEB
>> www.pathcom.com/~vhchan/bokeh.html
As background reading, a photographic look at Bokeh effects in different camera lenses

>> www.flarg.com/bokeh.html
A web-based simulation that lets you choose different Bokeh effects for a 3D scene, plus a SIGGRAPH sketch by Dan Wexler and Juan Buhler of PDI/DreamWorks on rendering Bokeh phenomena

>> www.neilblevins.com/cg_education/faking_bokeh/faking_bokeh.htm
A tutorial on faking Bokeh effects using a compositing program

ABOVE **Bokeh effects become visible here with a 'real' camera, as the lights on a California christmas tree appear to bloom into larger beads of light as they fall out of focus**

SIMULATING BOKEH EFFECTS

Many 3D rendering programs have the option to simulate a camera's depth of field (DOF) during a rendering. In most cases, DOF is controlled by entering an F-stop value for the program to simulate. The F-stop value in a real lens controls the aperture: the size of the opening through which light enters the camera. To choose an F-stop, remember that:

• Higher F-stop numbers, going as high as F16, F32, or F64, represent a narrow aperture, which would let less light into the camera. The smaller aperture only allows in parallel or focused rays of light from the centre of the lens, giving you a very deep DOF, with most of your scene in focus.
• Lower F numbers, going as low as F4, F2, or even F1.4, represent wider apertures. Wider apertures let more light into the camera, including scattered rays of light from different parts of the lens, allowing your background and foreground to fall out of focus, so that only the subject at your focal distance remains crisp.

Even if your renderer is capable of simulating *DOF* correctly, most renderers leave your soft-focused areas very flat, without creating any glistening Bokeh effects for you. A few new packages, such as the new *Brazil* renderer for *3ds max* (www.splutterfish.com) can simulate Bokeh as a part of their DOF rendering, and *LightWave 3D*'s DOF can simulate optional iris shapes to match the various styles found in different lenses.

However, you can add your own Bokeh effects to any render by processing the out-of-focus highlights in a compositing or – if you create stills – a paint program. See the Fact File for a Web tutorial on this process.

THE CG LANGUAGE

NVIDIA's new graphics language is finding increasing support among artists, but will it lead to real-time rendering?

Looking forward

The future of these major new lighting and rendering techniques probably lies as faster and more flexible hardware implementations

This article has thus far focused on new techniques in software-based lighting and rendering, and not on what's possible in real-time graphics cards. Real-time graphics are changing almost as fast as rendering software, and promise in the future to accelerate the previewing and development of shot light, in addition to possibly being used in a greater number of final renderings for some productions.

As you'd expect, any time enthusiastic companies are marketing a new technology, there is a lot of hype and unrealistic predictions. Some companies are even predicting 'feature-film quality' graphics in video games within the next few years, as if what could be done in real time could catch up to and match the state of the art in high-end 3D graphics production. The phrase 'feature-film quality' is a vague term, but the process of crafting the most impressive shots for feature films often takes weeks or months. The shot is staged, animated and composed to work at a particular camera angle; with many layers of graphics rendered, manipulated and composited together to create the final look. During the shot's development, versions of the animation, lighting, and compositing are usually reviewed and discussed every day by the director or effects supervisor until they reach final approval. This is a fundamentally different process from developing real-time content with full look-around capability. Predicting that the results of these two processes would be the same would be almost like predicting that live television and feature films would merge, and two-hour feature films would all be shot in two hours.

Hype aside, while not every new technique developed in high-end software will be rapidly emulated in hardware, the addition of key technologies such as shadow mapping, raytracing and programmable surface shaders to some real-time graphics cards promises a future in which 3D artists will be able to light scenes much faster and more interactively than they do today. Hardware that improves the basic process of adjusting your lights, and tightens the loop between when changes are made and when results are seen, could be the most important new technological improvement we see this decade in 3D lighting.

■ **Jeremy Birn is the author of the book *Digital Lighting & Rendering* (New Riders Publishing). You can find related on-line articles and tutorials or contact the author via his website, www.3dRender.com**

A new language called Cg, released this year by NVIDIA (www.nvidia.com), marks a milestone in the real-time graphics industry. In the past, designing real-time graphics for video games has required programmers to use different assembly language instructions, or proprietary codes for each type of graphics card. The new Cg language is being embraced by hundreds of developers as a standardised way to describe shaders and effects for real-time graphics.

The Cg Language will lead to much more sophisticated graphics in video games, with customised surface shaders able to reproduce subtle effects such as the Fresnel Effect (which makes specularity and reflectivity increase around the edges of an object and decrease on the parts of a surface directly facing the camera), or enhancing the look of a backlit character with translucent skin. In the past, these kinds of effects have been written into *RenderMan* shaders for feature film production, but have not been easy or even possible for video game developers to implement.

Once the Cg language is supported by most graphics cards and major 3D graphics packages, it will become possible for artists creating 3D graphics for film and television to have access to real-time rendering whenever they need it. For example, while adjusting a light, an 3D artist could see a preview of the shadow that it will cast into the scene. The big issue that is still being decided is: Will this lead to more graphics created entirely with real-time graphics cards, without needing a final software render at all? At some

companies, for some kinds of products, the answer could be 'yes'. However, other companies are more reluctant to make that prediction. When steps immediately before and after the rendering (such as dynamic simulation and compositing) are not yet done in real time, real-time rendering wouldn't significantly speed up the development of shots. Or it might involve trade-offs in image quality compared to existing algorithms available in advanced rendering software or their own proprietary code. There are also problems with inconsistency between the output of different brands or versions of graphics cards, and the difficulty of upgrading graphics cards in every computer instead of upgrading software versions to keep up with the latest technology.

Even as real-time graphics cards improve their capabilities, the competition from software-based rendering is racing forwards as well. Fast CPUs which used to be considered supercomputers are becoming available in affordable PCs. With a program such as *SoftimageXSI* (www.softimage.com), which features some of the industry's most advanced interactive rendering technology, a user can see a raytracing created in the *mental ray* renderer – or even a rendering with Global Illumination – dynamically updating in any modelling window as parameters are adjusted in shaders or lights. Whether renderings are accelerated with specialised hardware or simply through well-written software on a fast CPU, artists are seeing the creative process becoming faster and more interactive.

Backlighting through Flesh
finalDiffuse = FrontDiff + BackDiffusion;

Skin Oil Mask
oilSpec = oiliness * specular(Ln,Nf,V,oilRoughness);

Multi-Layer Skin
final = diffColor + subSurfColor;

Eye Refraction
refvector = Eta*v+((Eta*c1-sqrt(cs2))*Nf);

Anisotropic Hair & Lashes
specBasis = min(1.0f,(dot(hairShaftTangent,Ln)
=dot(hairShaftTangent,V))/2.0f);

Multiple Normal Maps
nSkin = normalize(Na+Nb);

Specular Paint Mask
Ks =
lerp(stoneSpecular,paintSpecular,
paintRGBA.w));;

Face Paint Mask
finalColor = lerp(skinColor,
paintColor,facePaint);

ABOVE This image was rendered in real time using NVIDIA's new Cg language to describe the shading. In addition to more elaborate video games, Cg will soon be supported via an NVIDIA plugin to leading animation software, enabling artists to preview their renderings in real time

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Jim Thacker
EDITOR

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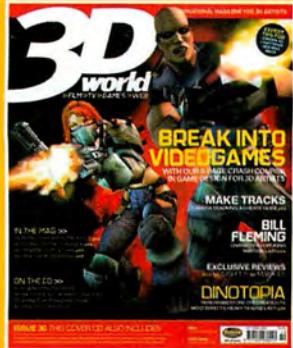
THE SWISS RE TOWER
SELLING A SKYLINE

The Swiss Re Tower, affectionately nicknamed 'The Erotic Gherkin', adds a new high point to London's horizon. 3D World met up with architectural visualisation whizz-kids Smoothe to find out how they created the stills that sold the Towering Innuendo **BY KAM MEMARZIA**
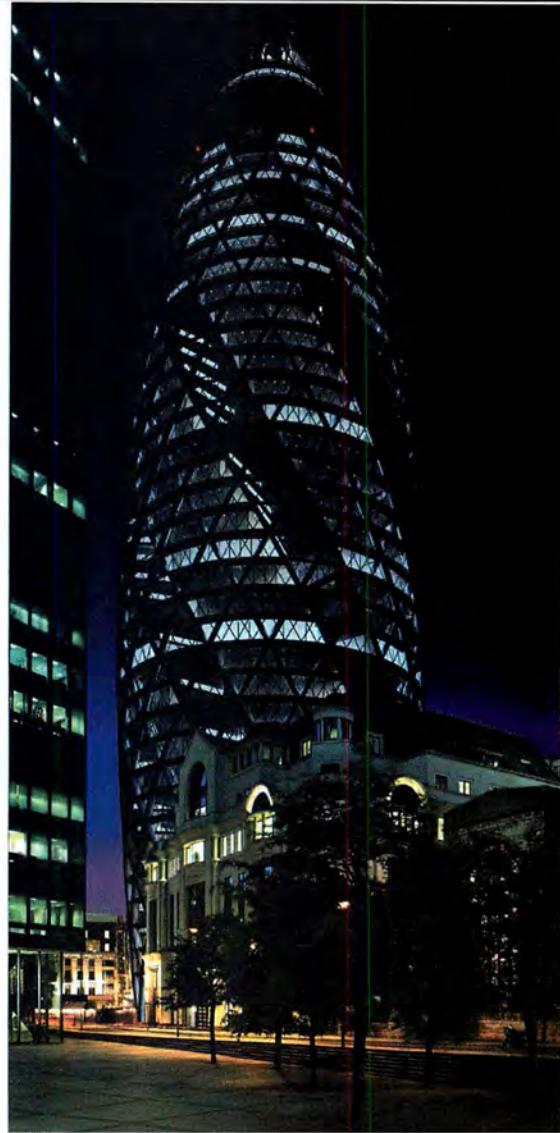
MAIN IMAGE **The marketing view of the proposed Swiss Re Tower, as seen from the south bank. This image was reproduced nearly eight feet high on the site hoardings**

LEFT **A night view from in front of the neighbouring CGNU building. This shows the Swiss Re Tower in low occupancy mode on a late summer evening**

O ne of the most prominent changes to the London skyline in recent history is undoubtedly the erection of the Swiss Re Tower. Currently being constructed at 30 St Mary Axe in the heart of London's financial district, the 40-storey, 180-metre building will be the second tallest structure within the Square Mile. The project has already attracted considerable media attention. Due for completion in 2004, the building has been dubbed the 'Erotic Gherkin' and the 'Towering Innuendo' for its rather suggestive, ahem, cigar shape – thin at one end, thick in the middle, thin at the other end.

Despite this, its designers, Lord Norman Foster & Partners, regard it as "the capital's first environmentally progressive tall building". Paul Scott, an architect from Foster & Partners explains, "It wasn't a concept where someone was flying across the Atlantic, saw a cucumber, and scrawled it down on a napkin. It was a collective effort, even at the conceptual

> "IT'S THE CAPITAL'S FIRST ENVIRONMENTALLY PROGRESSIVE TALL BUILDING. IT WASN'T A CONCEPT WHERE SOMEONE WAS FLYING ACROSS THE ATLANTIC, SAW A CUCUMBER, AND SCRAWLED IT ON A NAPKIN" **Paul Scott** ARCHITECT

stage. We took a holistic and balanced approach to what we wanted to do. The building is inclusive – the shape is intentionally non-competitive."

PARAMETRIC MODELLING

Foster & Partners used a parametric modelling system, originally developed in the aerospace and automotive industries for designing complex curved forms. The parametric 3D modelling process, which gave rise to the fundamental design of the building, is akin to conventional numerical spreadsheets, where relationships between the features of the design are stored as mathematical equations, **>>**

ABOVE **The corporate dining rooms at level 39 with the mezzanine bar just visible, top left. The background view is actually that from Tower 42**

MAIN IMAGE **The *Lightscape* results for the public plaza. An extremely tight mesh caused the fine light spill in the lower left corner**

allowing elements of the model to be changed dynamically in a 'live' model. This, according to Foster & Partners, "enabled a degree of flexibility never previously available". It also allowed curved surfaces to be rationalised into flat panels, demystifying the structure and building components of highly complex geometric forms, enabling an economical and efficient building construction process. "The building is radical – technically, architecturally, socially, and spatially. Both from the outside and from within, it will be unlike any office building so far conceived," Scott claims.

The unique aerodynamic form encourages wind to flow around its face, minimising wind loads on the structure and

> "THE BUILDING IS RADICAL – TECHNICALLY, ARCHITECTURALLY, SOCIALLY, AND SPATIALLY. BOTH FROM THE OUTSIDE AND FROM WITHIN, IT WILL BE UNLIKE ANY OFFICE BUILDING SO FAR CONCEIVED."
> **Paul Scott ARCHITECT**

cladding, enabling the use of a more efficient structure. Air is not deflected to ground level, which helps to maintain pedestrian comfort and safety at the base of the building.

"Tests have shown that the building will improve wind conditions in the vicinity," says Scott. "Natural air movement generates substantial pressure differences across its face, which can be used to facilitate natural ventilation."

But revolutionary though the design may be, it was not the Swiss Re Tower's structural properties that sold the building to

the general public. That task fell to the marketing imagery, created by architectural visualisation company Smoothe, which was commissioned to produce content for both the brochures and the website. This necessitated the acquisition of high-quality aerial images from the site – something that proved difficult in the days after the collapse of the World Trade Center and the subsequent War on Terrorism™.

TIGHT SECURITY

"We had no chance of being able to get helicopter footage of the site. We couldn't even use balloon photography," says James Cheeseman, Technical Director at Smoothe. "The site is next to some of the biggest tower blocks in London, and security was tight to say the least. We had to think of a way around it – a building of this importance needed a stunning aerial approach."

Eventually, Smoothe managed to secure access to the roof of the 28-story CGNU building immediately opposite the site, as well as the prominent Tower 42, previously the NatWest Tower & 42 storeys – the tallest building in the city. "We spent several very cold February nights at the top of Tower 42 with the cameraman, Jonathan Harrison, and our stills photographer, John Maclean," explains Cheeseman. "From the plant roof of both buildings we had fantastic views across the site and the whole of London, as you can see in the night

shots and the live-action footage in the animation. We developed a 360-degree panoramic from photographs taken from a crane on the site to use as a reflection map for the building and to provide the views for shots inside the building".

MODEL CONVERSIONS

Smoothe was supplied with a full set of 2D CAD files from Foster & Partners, as well as a skeleton 3D model, created in *MicroStation*. Initial attempts at importing this model into *3ds max* resulted in a half-day wait and several million faces for the main structural elements.

"Obviously, this wasn't going to sit well with *finalRender* or *Lightscape* rendering techniques," says Cheeseman. Smoothe therefore built a simplified model from the *MicroStation* skeleton with more detailed models created for the still images and animated sequences of specific areas, again created using *3ds max* and *finalRender*. The surrounding buildings and streets were also modelled and photo mapped to ensure accurate reflections and lighting conditions.

The modelling and rendering process generated a host of unresolved issues between the architects and the client in terms of the look and feel of the internal spaces, materials, and the finishing – all of which were in a state of flux. "For example, which kind of view will we have of the city? Which materials are going to make this place look smart and which kind of feeling do we want this space to transmit," asks Flavio Ochoa, Senior Designer at Smoothe. While most changes were quick to make, especially those concerning >>

STEP BY STEP: NIGHT VIEW

Ever felt guilty for over-enthusiastic posting in Photoshop? Rest easy, and enjoy this candid confession from James Cheeseman of Smoothe

"The view was taken from the top of Tower 42 by our photographer (John Maclean) around 7pm on a clear Valentine's Day. With a picture like this as the background, one third of the job was almost done. The difficulty was in the alignment and the lighting. For the view I used *finalRender* with plugins and *3ds max*, then used *Photoshop* to produce the final image."

1 PHOTOGRAPHY The background was composed of two high-resolution images, assembled in *Photoshop* to create a 9,940 pixel-wide file. I applied some colour dodge to the roads and icon buildings (Canada Tower) to emphasise their importance on the view and the existing contrast between dark and light areas.
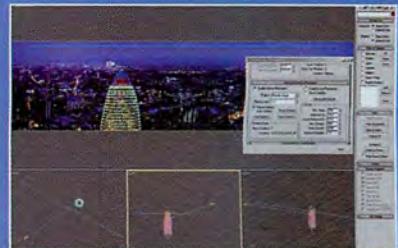
2 LIGHTING I used self-illuminated ceilings to generate the illumination on the floor plate plus a distant colour light to give some consistency to the exterior structure. Using the ceilings as light generators instead of physical lights reduced the rendering time. The glass is rendered in a separate pass.

3 BASE RENDER: PEOPLE AND FURNITURE Once the basic render of the tower was finished, it was populated with people and furniture. These are rendered in a different scene without any structure. The slabs are rendered with a shadow matte material, and vertical direct lights generate the shadows on the floor.
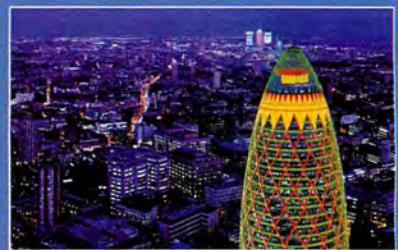
4 MASKING Because the people and furniture were rendered separately, I had to generate some masks to place them behind the structural elements. We created other masks for the main external glass, the internal walls, the variance on the glass, and the balustrades.
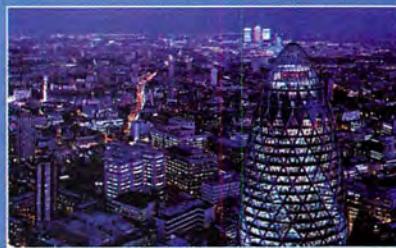
5 LIGHTING IN PHOTOSHOP I painted several colour dodge layers with the brush tool. The first, a blue, emphasised the 'Blade of Light' void on the tower. The second, an orange, was to create a warm atmosphere in the office space. Finally, I used a blue dodge for the restaurant on the top floor.

6 GLASS The layer for the glass was created in *max*, with a *finalRender* glass material of 100% opacity and reflection. The background was mapped onto a sphere to create accurate reflections on the tower. For the final touches I applied different brightness and contrast to each diamond to make it sparkle.
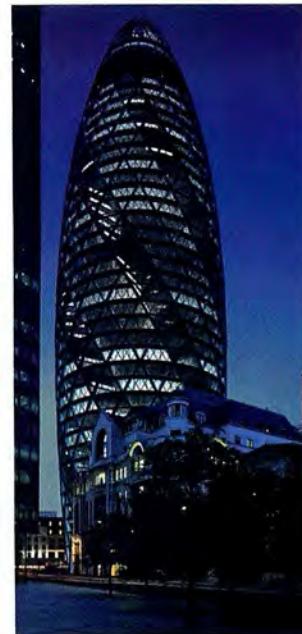
ABOVE **The marketing view for the lobby. The wall coverings are made up from about 2,500 stainless steel tubes, a nightmare for any raytracer!**

LEFT **This is the early evening lighting solution for the whole tower. It shows a higher occupancy rate than the later night shot**
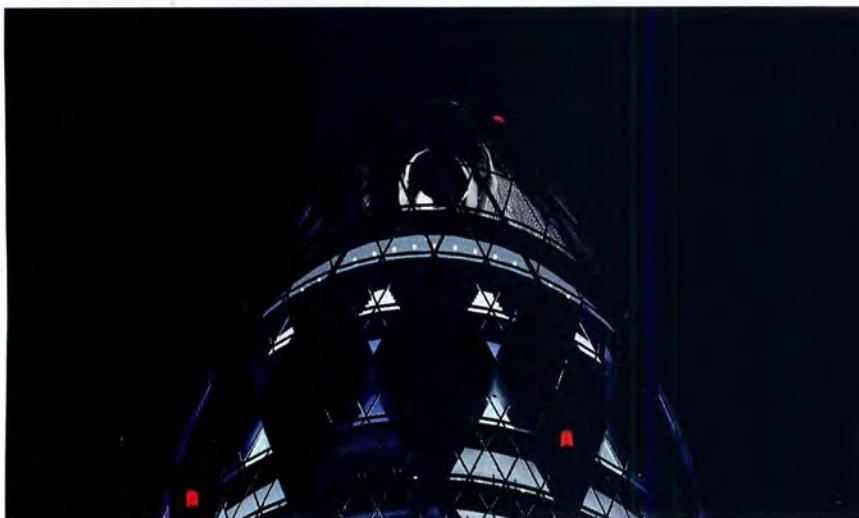
TOP **An interior view from level 22 with a close-up of the 'Blade of Light': the lighting system Smoothe tested in its simulations**

ABOVE **A detailed study of the lighting to the top floors of the tower – actually just a close-up render of the same model used in the early evening image shown on the top right of this page**

through several layers of transparent reflections," explains Cheeseman. "We managed to get it in there with just one extra 32-bit layer with some imaginative use of the shadow matte material in *3ds max*. As we're used to working with upwards of 100 layers on our still images, extending this thinking to the moving image was an interesting experience."

The changes haven't ended there, however. The many people involved on the client side of the project include Swiss Re, Foster & Partners, Bennett Interior Design (responsible for the office fit out), and Attick (brand and marketing literature and leasing agents of the building). To manage this multitude of clients, Smoothe uses an online review tool: essentially part of its intranet exposed through its website. With this, the company can quickly post updated draft images and receive comments from several clients simultaneously. This provides a paper trail of alterations and keeps a lid on changes required at late stages of the project.

BIG TEXTURES FOR A BIG BUILDING
In total, the marketing material took three months to produce, resulting in eight images and two minutes of animation. The renders were on average 5,000 x 1,000 pixels, with each image requiring up to 20 separate layers of diffuse, shadow, lighting, and mattes. Textures used in the model were mostly developed from high-resolution photographs of sample material provided by the architect. For this, Smoothe retains a team of dedicated *Photoshop* artists – a vital investment when it comes to creating textures this large.

The second phase of the project was the creation of a comprehensive lighting scheme analysis. "The lighting

colour changes, the client's desire to make changes on almost finished images and animations led to total reworks.

"At one point we were asked to add a structural beam to the façade on an interior camera move. The shot was already composited and had about ten layers, including greenscreen actors. The main structure had been rendered as one layer with glass and reflection masked in later. The element to be added was right in among the structure and would cut

> "WITH LSNET [NETWORK RENDERING FOR LIGHTSCAPE], YOU CAN SPECIFY A RADIOSITY SOLUTION TO RUN TO A SET PERCENTAGE AND THEN FOR IT TO KICK OFF A RAYTRACE OF THAT SOLUTION READY FOR YOU THE NEXT DAY." **James Cheeseman** TECHNICAL DIRECTOR

consultants, Speirs and Major, asked us for a blank image so that they could create a 2D representation of their lighting design. We offered to represent it in 3D – to create a full *Lightscape* model of the entire building complete with all lights. Speirs and Major proposed this to Swiss Re, which commissioned us to do it," says Cheeseman.

MANY LIGHTS MAKE HARD WORK

The aim of this process was to test the lighting design and evolve the model as the project progressed. In hindsight, had Smoothe been aware of the 'scientifically accurate' rendering this would entail at the beginning of the project, a single model could have been generated that could have been used for both lighting design and marketing images. However, since this was not the case, a new version had to be produced.

The renders from this *Lightscape* model were to be composed into new photographs of the site at different times of day to show the varying states of the lighting. A detailed look at the public plaza at the base of the building was also required. This was to compare the new lighting in context with the existing street lighting and light spilling from the surrounding buildings. The client wanted to show its lighting scheme to the end users – local occupants and the company board – hence the *Lightscape* model ran to a couple of million faces and over 6,000 individual luminaires, all with a specific lamp colour and intensity value.

"We had to be able to look at different lighting scenarios, and to be able to turn whole floors on and off at the flick of a switch. *Lightscape* is fairly fast, but with this model we had to wait 24 hours for each solution to process. Luckily, we had the network rendering set up, and could load the model with varying layer setting files and send off multiple variations to all the machines on our LAN. With *LSnet* [network rendering for *Lightscape*], you can specify a radiosity solution to run to a set percentage and then for it to kick off a raytrace of that solution ready for you the next day," says Cheeseman. This methodology enabled Smoothe to develop multiple solutions quickly and within tight deadlines.

"We had to gather photometric data from ten suppliers to specify to 6,000+ light fittings. Each 'bank' of lights had to be on a separate layer so we could simulate different levels of occupancy on different parts of the office floors. The process took days and we only had five weeks to complete it. Obviously, we delivered on time and far surpassed the client expectations," Cheeseman concludes.

And not for the first time, either. In just over two years, Smoothe has become renowned for its ability to create images that raise funding, win competitions and planning permission, and pre-let commercial properties. But the Swiss Re building is – and will probably remain – the most striking example of its pioneering work in the use of virtual environments as a marketing platform within the construction industry. ∎

STEP BY STEP: LIGHT WORK

How Smoothe used Lightscape to prove the proposed lighting design for the Swiss Re Tower before a penny was ever spent on the fittings
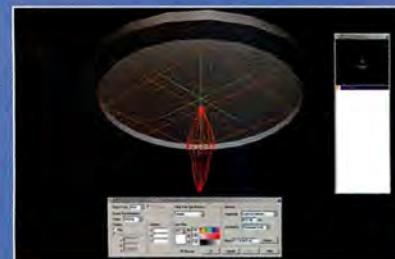
1 The plaza model imported from *3ds max 4* into *Lightscape 3.2*. *Lightscape* requires very accurate modelling without any overlapping vertices or polys. Every element has to fit accurately against the next – you can't intersect anything. The dense mesh on the left accurately records the illumination from the strip lamps under the benches.


2 Each simple model of a light fitting has a photometric file attached to it. These files contain data for the spatial distribution and intensity of the light emitted from the luminaire. Smaller elements of geometry such as this can be excluded from light reflecting back into the scene, which reduces the processing times without affecting the accuracy.

3 The full *Lightscape* model with all the luminaires necessary for this shot. The model has six further storeys out of the shot with lights to ensure any contribution to the plaza lighting is accounted for. The black surfaces in the upper windows in this shot are the blinds; these are all modelled with individual blades and specific material properties.

4 The *Lightscape* process shoots the light from each fitting in turn and then calculates the light reflected from each surface in order of intensity. Around 75% of the way through, the image really comes to life, but the more complex the model the higher the percentage you need. The full tower shot had to run to about 98% – about two days' worth.

5 The final raytraced plaza shot overlaid with a false colour diagram showing light levels from 0 to 200 Lux (blue to red, respectively). Lux is the physical unit that describes how much light a surface receives. How bright that surface appears will depend on its material properties. *Lightscape* can also display the perceived brightness of a surface.

6 This is the final shot, post-*Lightscape* and post-*Photoshop*. The street scene in the background is a separate *Lightscape* model illuminated with streetlights and composited in *Photoshop*. Smoothe also used *Photoshop* to make a few adjustments to the final render from *Lightscape*, just that extra bit of 'love' to bring the image to life!

PROFILES

Box

The up-and-coming Manchester studio's co-founder Mike Kirwin discusses award-nominated cardboard cities, guerrilla movies, and the art of thinking inside the Box

BY MARK RAMSHAW

With a dozen music channels now pumping out promo videos 24 hours a day, it takes a lot to stand out from the crowd. But six months since it first aired, the all-CG promo for DB Boulevard's 'Point Of View' still shines (and continues to enjoy heavy rotation) – and all thanks to an inspired decision to render the entire animation with cardboard texturing.

"We couldn't quite believe the video had been nominated for a LEAF award," admits Mike Kirwin of Box, the studio behind the promo. "From starting out using really shit computers five years ago, to moving the company along unaided, to getting a nomination... to say we're pleased would be a real understatement."

Mike and Jeremy Hogg founded the Manchester-based studio five years ago. Since then the team has expanded to include animators Anthony Carysforth and Philip Child, and the single Mac running *Photoshop* and an old PC with *Infini-D* have been replaced by a muscular *Maya* and *3ds max*-based PC set-up.

Mike admits that the few couple of years spent working on self-supported projects were extremely difficult.

"No one will take a chance on you until you've already got some work under your belt. Eventually, we got our foot in a few doors, just enough to slip in our showreels,

BIOGRAPHY

Box was co-founded by Mike Kirwin and Jeremy Hogg in 1997. At the time Mike had just spent ten years working in the music industry, but work on an interactive CD-ROM inspired him to make the move into 3D. Jeremy was fresh from an interactive arts course at the local uni.

"He touched on a bit of digital art, but really we're pretty much self taught," says Mike.

Finding it difficult to secure work, the pair began working on self-financed projects, before breaking into corporate video work. Clients included Nike, Intel, and communications company, ICO. The Intel work was particularly entertaining.

"We worked on all the models and animations for a racing game, which they used for a workforce trip to Monte Carlo. The employees would sit in pods, answering multiple-choice questions to make their cars go faster."

From corporate graphics, the studio edged its way into regional TV work, doing jobs for little pay in a bid to bolster its showreel and attract more clients.

"We were generating thirty-second title sequences for a few hundred quid, but once you've created the product then people can see you're capable of doing the work in future. Eventually, we branched out into national TV, and then landed the tasty rebranding job for MTV2."

"It's the acceptable face of poppy house, and we liked it," says Mike of DB Boulevard's 'Point Of View' track

The wonderful cardboard look of Box's LEAF award-nominated 'Point Of View' promo came about out of necessity rather than a desire to develop a new rendering style

Box has made the transition fro
ad spots to four-minute project

Box created 3D models from Ter
Gilliam's original madcap artwor

and managed to get some paid work doing corporate videos. Any money we earned was ploughed back into the company for more hardware and software, and we just slowly continued to build the company."

This determination has clearly paid dividends, with the studio's profile growing immeasurably as it's broadened into broadcast. Notably, Box created a series of idents for MTV2, bagging the studio a number of awards. And then there's been the studio's work on the promos.

"The first was for a regional artist we knew: Mr Scruff. We'd been begging him to have a go at one of his records for about two years. And then that led to a shot at doing the DB Boulevard promo."

Keen viewers may have also noticed an ad for online insurance firm esure, aping the cardboard-textured CG style of the DB Boulevard 'Point Of View' promo.

"The ad agency liked the music video, and wanted us to replicate the style," says Mike. "We didn't mind, and were handsomely paid for doing it, which we hadn't been before. But then when we did the music video, money wasn't an issue; the important thing was the chance to do a high-profile promo. Money tends to be a secondary issue anyway. I think if we were motivated by money we wouldn't be doing this."

Generally, though, Mike says the studio likes to continue pushing forward rather than relying on any signature graphical styles.

"Because we're a small operation we know we have to constantly keep on learning, experimenting, and trying out different techniques. And everything is evolving so fast that you don't really ever get into a single groove."

STRENGTH THROUGH DIVERSITY

Surprisingly, Box hasn't worked on any promos since, though this is as much due to problems with the way the music industry works as anything else.

"The timeframe is just so tight, with labels hedging their bets by not commissioning a video until the 11th hour," explains Mike. "They'll usually only do it if it's for a well-known artist, and so have full confidence they'll sell enough units. But of course that's a Catch-22 situation, because with bigger artists they're pushing a brand, and so need the artist to be seen."

Instead, Box continues to diversify in a way that seems extraordinary given its size. The team is even involved in film work, providing production, editing, compositing, and 3D special effects for the independent movie, *Getting Off*.

"It's quite an underground film, in that that everything is begged, borrowed, or stolen," says Mike. "So many people seem to wait for somebody else to give them permission, in the form of lottery grants or whatever, but that process is so debilitating. It's difficult enough trying to raise money for shorts. When you mention feature-film work, people run a mile."

There are also plans to develop a 3D CG-based long-form broadcast project, with production planned to commence next summer.

"At the moment we're just busy collecting rejection letters from TV companies," laughs Mike. "It's difficult for them to make space in their schedules for animation pieces. You find it in kids' TV, but that doesn't really interest us – we want to do 3D character dramas."

"Hopefully, this is where TV will change," he continues. "At the moment it's either full-on feature work or tiny animated shorts. There's no middle ground, and that's what TV needs to address." ■

NAME	Mike Kirwin
AGE	35
JOB TITLE	Co-founder
COMPANY	Box
BASED	Manchester
WEB SITE	www.the-box.co.uk
PRODUCTS USED	Maya, 3ds max, Photoshop, After Effects, Razor

FUTURE GOALS
"We are moving toward longer-form animation and self production. Ultimately, what excites us is securing funding for a series where we can retain control. In the meantime, we've got to pay the bills, and so will continue to work on promos, commercials, and TV graphics."
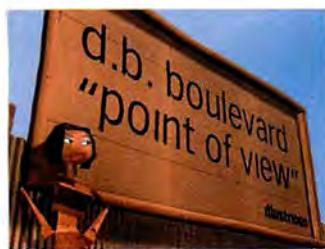
"Talk about a steep learning curve; it's been vertical in places," says Mike

Box came to real prominence with a series of idents for MTV2. The sleek animations provided a visual cornerstone for the music channel's brand

"MONEY IS A SECONDARY ISSUE ... IF WE WERE MOTIVATED BY MONEY, WE WOULDN'T BE DOING THIS."
MIKE KIRWIN,
CO-FOUNDER OF BOX

Box had to come up with a likeable character design for its Freedom Finance job in just seventeen days

The company has created visuals for a number of TV programmes, including graphics for the *I Love...* TV series

CREDITS:

Mr Scruff pop promo for Ninja Tune (**1999**), title sequence of *The Millionaire Show* for Granada (**2000**), title sequence of *Real Estates* for BBC 2 (**2001**), title sequences of *I Love TV* for BBC 1 (**2001**), animated TV presenter of *I Love Monty Python* for BBC 1 (**2001**), title sequence of TV's *Finest Failures* for BBC 1 (**2001**), DB Boulevard pop promo for Sony Music (**2002**), CG ad spot for ESure (**2002**), CG sequence for Freedom Finance ad spot (**2002**)

AWARDS

1999 – ICA, 1998/1999 One dot Zero, Shots' Showcase Oct/Nov for Mr Scruff 'Honeydew' pop promo
2001 – Best Of Show Design Week Awards, BDA Award Winners Promax&BDA2001, Silver Nomination at D&AD Awards, and Best Video Film and TV Graphics for MTV On Air Graphics
2002 – Shots' Showcase Mar/April and LEAF pop promo nominations for DB Boulevard 'Point Of View' promo

Sam Coates

Set in 40 square kilometres of virtual London, The Getaway is the most ambitious game yet to have been developed in Europe. It's certainly been an education for Lead Artist Sam Coates

BY JON JORDAN

BIOGRAPHY

After graduating in architecture, Sam Coates moved into computer graphics in the early 1990s, doing freelance contract work mainly for corporate clients. From this he moved to a small multimedia company carrying out a varied selection of jobs from writing and directing videos to 3D graphics. With the release of cheap 3D graphics cards for PCs as well as consoles such as Sony's PlayStation, computer games made the switch to 3D graphics in the mid-nineties. "I had always wanted a job in games at the cutting edge of technology," Coates says. "When games went 3D, my skills were in demand, and for the first time in my life, I found myself with a choice of jobs." He joined Sony Computer Entertainment Europe's Soho studio and has been there ever since. Prior to *The Getaway*, Coates worked as an artist on two racing games, *Porsche Challenge* and *Rapid Racer*. Between 1997 and 1999, he was involved in a number of projects that were never completed. He joined *The Getaway* team in September 1999, just as the project was being redesigned for PlayStation 2.

S omehow it's appropriate that the past three years of Sam Coates' life have been dominated by the Sisyphean task of digitally mapping 40 square kilometres of central London. Despite joining the computer games industry in 1996, buildings were his original vocation, after all.

"At university I studied architecture. It's something that's haunted me ever since, particularly on *The Getaway*," he laughs. To put the workload into perspective, Coates estimates the art team at Sony's Soho studio has spent around 20 man years on this task, generating 50,000 source photographs, 6,500 reference photos and 45 hours of video reference in the process. The result is 110 kilometres of driveable (and walkable) London roads in Sony Europe's ambitious computer game, released at the end of the year.

Billed as the most cinematic and realistic game to date, *The Getaway* is an all-action thriller, cut from the same inspirational cloth as gangster movies such as *Lock, Stock and Two Smoking Barrels*. The player, either in the role of hard-as-nails conman Mark Hammond or bent copper Frank Carter, has the whole of London, from Hyde Park in the east, to Angel in the north, Southwark in the south and Old Street in the west, in which to speed and fight. It's a huge area, and one that has created plenty of headaches for Coates and his art team.

As well as the miles of road, *The Getaway* features 20 interiors, each of which has been modelled from a real London location, including pubs, warehouses, strip joints, and drugs factories

The Getaway's realistic approach to modelling guns is shown here by this AK47 assault rifle

But while he agrees that the process of going out with a digital camera is part of the problem, Coates claims it's not this element that makes the project so hard.

"The biggest issue is its sheer size. When we started, people were building models and putting in all sorts of detail, such as window frames," he says. "It wasn't a problem in terms of the number of polygons, but it didn't look good as there was lots of artifacting and aliasing." For that reason, architectural features smaller than 25cm aren't modelled in the game.

SUSPENSION OF DISBELIEF

Another key element to getting the job done efficiently has been training the artists' observational skills. "We're limited by the power of the technology and the timescale of the project, so artists have to be able to look at the complexity of a busy London street and pull out those handful of elements that convince the player they are driving around a real city," he says. Because of this, Coates is careful about referring to the game as 'realistic'. "For example, our traffic system isn't realistic," he points out. "It looks realistic and it behaves in a realistic way, but there is a suspension of disbelief, not reality. Real is sitting in a traffic jam in Piccadilly Circus."

A related obstacle particular to the medium of the computer game is that the resulting environments and models have to fit within a fixed amount of RAM bandwidth in terms of the console the game is designed to work on, PlayStation 2. "Usually, in a game you have a certain amount of freedom to design out some of the tricky bits," Coates explains. "If there are too many polygons in a scene, you can reduce the number of visibles – by putting a bend in a street, for example. Obviously we can't do that." The game's design also required that the players would to be able to explore the whole city without any breaks for loading. "This requires continuous loading so all the scenery graphics are constantly streamed from the DVD into the smallest of memory buffers," Coates reveals.

With 52 full-time developers, of which 28 are artists, *The Getaway* team is the largest in Europe and managing it has become a full-time occupation. "In the early days I took responsibility for playing around with the first PlayStation 2 development kits; finding out what we could do," Coates recalls. Now, however, he just looks after the day-to-day running of the art team.

The 28 artists are broken down into smaller groups, each of which specialises in different areas of the game, either generating the 20-odd motion-captured and 3D-scanned characters, car models, or the masses of environmental modelling. "We let them move on to a different area when they've finished a section of work so they can keep fresh," Coates says. "Keeping artists going for three years is always a problem." Something that proved useful in this respect was running a regular open review session every Friday so people could show off their work.

As for the end result, Coates believes the past three years have been time well spent. "I'm most proud of the fact that artistically, players feel they are really in the gritty, dirty London we set out to build," he boasts. "The reaction we got from Londoners when we showed the game at the PlayStation Experience in September was just amazing. If we can convince them, then I'm sure non-Londoners will certainly feel like they're in the real city." ■

NAME	Sam Coates
AGE	31
JOB TITLE	Lead Artist
COMPANY	Team Soho, Sony Computer Entertainment Europe
BASED	London
WEB SITE	www.scce.com
PRODUCTS USED	*Maya, Photoshop, Kaydara FiLMBOX, OPTPiX iMageStudio*, and "a big heap of in-house tools and far too many project management programs"

FUTURE GOALS
"It's easy to bolt on new areas or to open streets anywhere on the map. Next time, I'd like to include a bit more of the seediness around King Cross," muses Coates

The star of the game is nutcase and all-round hard arse, Mark Hammond

"WE'VE BUILT AN EVEN MORE CONVINCING VERSION OF LONDON THAN WE SET OUT TO AT THE START OF THE PROJECT: A GRITTY, DIRTY CITY."
SAM COATES,
LEAD ARTIST, THE GETAWAY

There are no health or ammo bars displayed on screen. One blast from a shotgun-wielding yardie and it's game over

Sony hopes giving players the ability to cause mayhem on the streets of London will be a big selling point

CREDITS

Artist, *Porsche Challenge*, (1996), PSOne, SCEE
Artist, *Rapid Racer*, (1997), PSOne, SCEE
Lead Artist, *The Getaway* (2002), PlayStation 2, SCEE

The Getaway seems sure to take the game violence controversy to another level: something Sony has underlined by giving it an 18+ age rating

READER SURVEY

Dear Reader,

Here at *3D World* we're always interested to hear what our readers have to say because it's our aim to provide you with the type of magazine you really want to read. To help us achieve this, we've drawn up an **Online Reader Survey** to give you the opportunity to tell us what you think of *3D World*, good and bad, and to find out a little more about you and your lifestyle. We'd be very grateful if you'd please take the time to visit the online survey website and answer the questions you find there.

We appreciate that most of you are busy people, so to encourage you to spend your valuable time filling in our questionnaire, we are giving away some prizes. Anybody who completes the questionnaire by 31 December 2002 will be automatically entered into a **Prize Draw**. The first reader drawn from the hat will receive a £500 Training Voucher to exchange for training at Escape Studios, Europe's only dedicated school of visual effects. And the next two entrants to be drawn will each receive a Gainward GeForce4 PowerPack! Ultra/650 XP graphics board.

Complete the survey at www.3dworldmag.com/survey but before you start, please refer to the How To Take Part box below for details of the password you'll need to enter the site. Whatever you think of *3D World*, we'd like to hear from you. Please be honest – your answers won't effect your chance of winning.

Many thanks for your time and help.
Jim Thacker EDITOR

1st prize

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HOW TO TAKE PART

To take part in the 3D World Reader Survey, please visit the website at:

WEBSITE: www.3dworldmag.com/survey   **PASSWORD:** RADIOSITY

Pro tip
for lighting

No matter how delicate your textures or intricate your modelling, lighting can make or break a scene or animation. Even a subtle change in the placement or intensity of a light can change the mood from happy to sad, welcoming to threatening. Here our experts provide some handy shortcuts and examples of what lighting can do for you.

Our experts

>> **ED HARRISS**

Ed Harriss is a 3D artist living in the USA. He creates training material for *Softimage|XSI* and *mental ray*. For more information and instructional material visit www.EdHarriss.com

>> **GRZEGORZ JONKAJTYS**
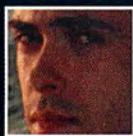
Creator of the award-winning short film *Mantis*, as featured in *3D World* issue 17, Grzegorz specialises in character animation and illustration in his homeland of Poland. www.3dluvr.com/jonkajtys

>> **ENI OKEN**

Eni Oken is a 3D artist specialising in creating fantasy and whimsical designs. She offers online workshops on texture creation and fantasy design. You can see her portfolio at www.enioken.com

>> **FRANK VITALE**

Mr Vitale is a regular contributor to *3D World*. He also lectures, and practises digital illustration, game development, animation, visual effects and motion graphics. www.vitalef.com

>> **DAN ABLAN**

Dan is author of the hugely popular *Inside LightWave* books, and his latest, *Digital Cinematography and Directing*, has just been published. His 3D animation company is AGA Digital Studios. www.agadigital.com

S

01

02

03

Creating sunlight

REQUIRES: Any 3D package

A frequently made mistake is to attempt to create sunlight by using a point or omni light. This can work, but if you're not careful, you end up causing more problems than you solve. The stumbling block with this techniques is that the light will need to be very far away from the scene to create the proper effect.

Placing the light source so far away can cause problems when navigating your scene. For example, if the point light is one million units away from the nearest object, then framing all of your objects would zoom the view out so much that everything in the scene would appear as tiny dots on the screen.

Another drawback is improper shadow angles. Because the sun is so far away, it produces shadows that are virtually parallel to each other. However, a point light will create shadows with angles that are based on the relative positions of the objects to the light. As a result, some shadows might be pointing in completely opposite directions from one another. It would look like the sun were just a few feet above the surface of the planet.

For sunlight simulation, you are better off using something like an infinite or directional light.

>> ED HARRISS

Ambient light

REQUIRES: Any 3D package

Every software program has this function. In most programs there can be only one ambient light source, it can't cast shadows, and it shines from everywhere in all directions at once. When the ambient light is turned on it affects everything that has an ambient material colour other than black.

For the vast majority of the time, this type of light should not be used. Ambient light illuminates the ambient portions of your objects evenly, and because of this, the painstakingly applied details of your objects will disappear. Those details will be replaced with flat, unrealistic areas.

In the first screenshot above [02], the asteroid is lit with a normal light and the ambient light is turned all the way down. In the second shot [03], the ambient light is turned up. Notice how all of the detail that was in the asteroid has disappeared. Since everything is lit the same from all directions there is no variation in the light as it illuminates the surface. Therefore, the bumps and cracks are completely flattened out.

Bottom line: it's a good habit to turn your ambient light off or down to zero every time you start a new scene.

>> ED HARRISS   **>>**

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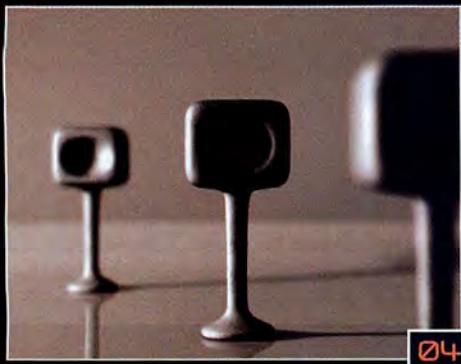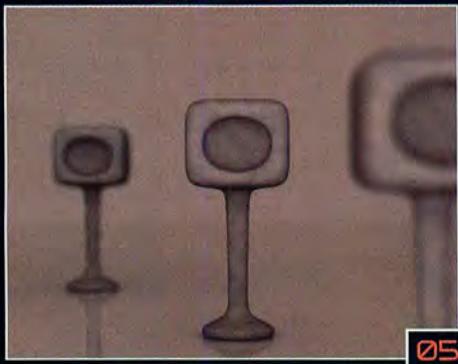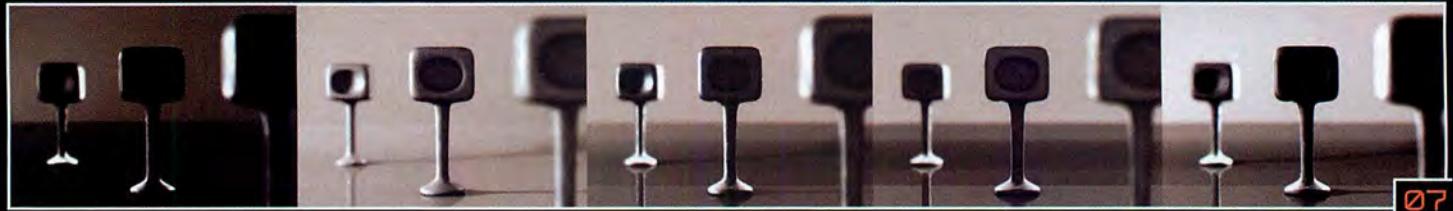
Ø7

Lighting in layers
REQUIRES: Any 3D package

Every subtle change to the lighting of a scene can make a huge difference in the global perception of the image. If you're not sure what kind of mood you're looking for, it's a good idea to prepare layers of lights: render each type of light as a separate file, and composite it *Photoshop* or another program.

To illustrate this procedure, in this scene I have made three basic lighting set-ups.

[Ø4] Directional light
The scene has only one strong area light from the left.
[Ø5] Global illumination
It's perfectly possible to use genuine global illumination if your package supports it, but any simulation of soft ambient lighting with soft shadows will do the trick too.
[Ø6] Backlight
The backlight set-up is very important, since it really gives a sense of realism. You can create the backlight set-up using any type of light.
[Ø7] Composite versions
You can easily composite those three layers and play with them. As a result, you can achieve plenty of different moods of lighting. The differences can be subtle or dramatic. Picture [Ø7] shows five different lighting types, created from the same rendered layers. You can create unlimited variations, playing with different saturation, color corrections, different modes (multiply, add, overlay), and so on.
>> GRZEGORZ JONKAJTYS

Area lights
REQUIRES: Any 3D package

There are many ways to light a 3D scene. Most 3D applications have the same basic set of lighting options: you'll have omni, directional, spot, tube or cylindrical, object and area. You may also have GI, or Global Illumination. Each of these lighting types has its benefits and drawbacks. Some are quicker but have less options to choose from, while others can produce absolutely realistic effects but are computationally expensive.

GI is the ultimate lighting solution, but to achieve the results we'd all expect to see, the render times can be long. Omni, directional and spot lights are all relatively quick to render, but lack the realism of GI. Then there are shadow options and attenuation options. Basically it amounts to this: for realism you'll need time, most likely lots of time.

Area lights are a reasonable compromise between quick and rough, and slow and realistic. Omni, directional and spot emit their light from a single point. This doesn't happen in the real world (with the possible exception of the sun or moon, as they are so far away) – light is actually emitted from an area. On a cloudy day the clouds are the area. With a table lamp the lamp shade is the area. Even with the headlights of a car, the reflective mirror is the area.

Area lights are slower to render than the other
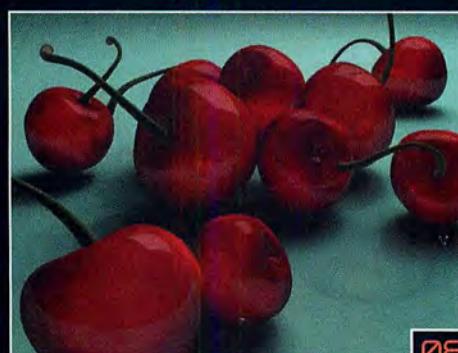
Ø8

options, but still much faster than GI, and often can be used in lieu of GI with little noticeable difference. For this example I'm using the area lights from finalRender, working in *3ds max 4.2*.

You set the size of an area light just as if you were creating a flat plane. You also set the number of samples the light is going to use to produce light, and the size and shape of the samples. More samples are not necessarily better – three to five in each direction is fine – it's the size of the samples that matters. Say your area light is 200 x 200, and you have 4 x 4 samples; to get a nice soft shadow that really blends out quick, you'll want the sample areas to overlap. In the cherries example in picture [Ø8] below, the area type is a disk with a radius of 150. This ensures that the area from each of the four samples will overlap and create a nice soft shadow. Play with these values to adjust the 'softness' of your shadows.

We'd have no shadows at all without shadows selected for the light. The shadow type is set to fRSoftShadows. You can use a shadow map or ray trace for shadow type, but they will not provide you with accurate shadows. You'll get the typical look of shadow map or ray tracing, but not the realism of a shadow that falls off. Sampling is also very important; too low and you'll end up with a very noisy image, too high and your render times will be excessive. Here I'm using 64 and 256 for the min and max surface sampling values. I find that this setting is as high as I need to go to get the look I'm after.
>> FRANK VITALE

Using a gobo light
REQUIRES: Any 3D package

Almost every 3D artist knows the importance of using good lighting to create realism in 3D. However, few artists are aware of the importance of 'layering' to create interesting and intricate imagery.

09
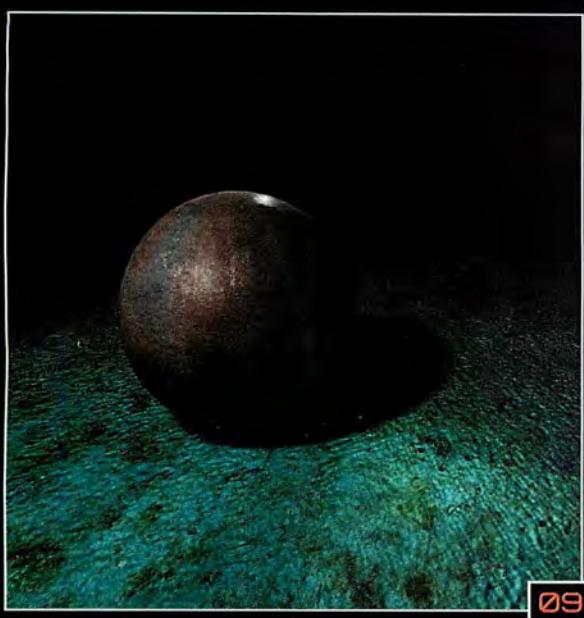
Besides layering 3D objects in the classical middle ground, foreground and background layers, artists can also layer textures to form more distressed and natural effects. The rule is: the more layers you have, usually the better things turn out.

Using a gobo light as yet another layer can help increase intricacy and add more distress and dirt to a scene. Most 3D software programs provide the option of using a projector light, that is, placing an image map over the light. The image map serves as a filter, enabling light to pass through depending on the brightness of the image.

In my example, the first image [09] shows a sphere placed over a box, both with simple texturing applied. The main key light is not projecting any maps.

In the second shot [10], two of the lights have projector maps, acting as gobo lights. Notice how, even though the effect is subtle, it can increase dramatically the amount of distress and color variation in the scene, aiding naturalism.
>> **ENI OKEN**

10

Coloured shadows
REQUIRES: LightWave 3D

Every so often, you may find yourself in a 3D lighting situation that requires more than just your typical shadow. Shadows are very powerful in 3D, as they are one of the key elements to adding depth and realism to a scene.

But taking it a step further with *LightWave 3D 7.5*, you can make your shadows have colour. Typically, shadows are really nothing more than black, or variations thereof. The first shot [11] shows a typical spot light on an object. It looks okay, and the shadow falls nicely. But the second shot [12] shows the same scene with three lights and three shadows, each having their own unique colour.

You can change the colour of your shadows by selecting the desired light in Layout, then pressing the [p] key to open *LightWave*'s Properties panel. There, click the Shadows tab in the middle of the panel and set your colours.
>> **FRANK VITALE**

KEY TO IMAGES

08 AREA LIGHTS
Area lights are a reasonable compromise between the realism of Global Illumination and the fast render times of options such as omni and spot lights

09/10 GOBO LIGHTS
The first image has no gobo; the second does. You can see how its addition subtly aids the naturalism of the image

11/12 COLOURED SHADOWS
The first image shows the shadow cast by a typical spot light. The second illustrates how multiple coloured spots might cast their respective shadows in *LightWave 3D*

13 FAST SHADOWS
LightWave's shadow maps are created in memory, not by processing. This means that you can create impressive shadowing with little or no increase in render times

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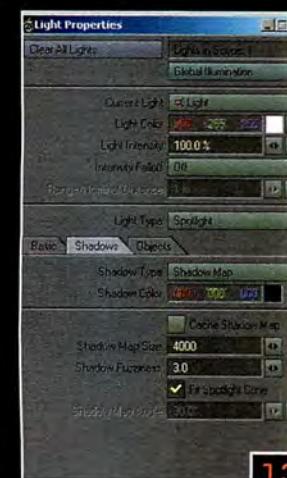
Fast shadows
REQUIRES: LightWave 3D

You don't always have the time you'd like to include ray traced shadows in your jobs. Sure, they are more accurate, but there's that nasty hard edge. Of course, you can use an area light for realistic, soft ray traced shadows, but you don't have two weeks to render each frame.

So, what do you do? You use shadow maps, of course. *LightWave*'s shadow maps are created out of memory, not processing, so there is no significant increase in render time when using them. Shadow maps can only be used with spot lights, and they are not as accurate as ray traced shadows, but they do enable you to have soft edged shadows.

Using shadow maps often results in shadows with jagged, even flickering edges – unless you know the trick to avoid them, that is.

Simply keep your spot lights wide and tight. What that means is you need to make the spot light cone angle wide, say 60 degrees or more. This will spread the light over more area. Because of this, you can move your light in close to your objects. Doing this eliminates those nasty jagged edges often found when using shadow maps. In addition, you can up the Shadow Map Size option in the Lights Panel to well above the default 512 – say 4,000. This will assign more memory to the calculation of the shadow, hence, giving it more detail.
>> **DAN ABLAN**

TRADE SECRETS
LOOK DEVELOPMENT

How can you get the look of a scene right in your final renders? Just develop it in a compositing package where it's easy to adjust the subtleties **BY MARKUS MANNINEN**

Quite often, the development of the look of a scene can grind to a painful halt. This can occur due to lack of time, inexperienced technical directors, tools that simply refuse to give you that fine control you need – or worse, clients who can't make up their minds on the look they want. Instead of endless days going round in circles, trying to build the shader tree from hell, and ultimately risking delivering an inferior product (or, more disastrously still, not on schedule) the solution can be to take look development out of 3D and into 2D.

This means that the 3D process – where we usually develop a finished look that then gets split into render passes for integration with live action – changes to creating several passes from 3D that will support the look development in a compositing package.

At Framestore CFC, we keep this 'look compositing' in our 3D team so that the technical director rendering the passes is actually the one compositing the look of the character. The usual passes are later handed over for final compositing. Sometimes, this is the only way to ensure that the product gets delivered.

For many technical directors, this way of working takes some getting used to, but it's a powerful method that will allow you freedom and control when used correctly. Just because you're stepping outside of the 3D package, it doesn't mean you lose any control. You simply gain speed in a difficult situation.

> Markus Manninen is Animation Director, Supervising Animator, and Head of 3D Commercials at Framestore CFC. He won a Gold Lion at Cannes Advertising Festival for the fabulous Levi's Odyssey commercial
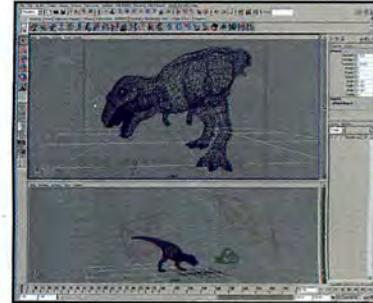
1 3D scene To illustrate the method, we have a simple 3D scene featuring a polygon dinosaur, a polygon ground plane, and three area light sources (rim, key, and fill) in *Maya*. We create several scenes out of this to create the necessary render passes. You can use procedural tools that create the different render pass scenes automatically, but we're using *After Effects 5.0*.
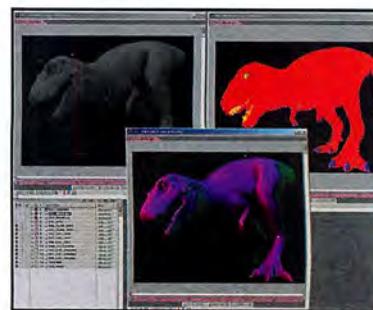
5 Build blocks Separate your multi-passes so that they are clearly accessible in your comp. Rename them so you know what to use them from. The multi-pass gives us the possibility to control the shading on different pieces of the character separately. Even though we have yet to establish the final look, you must separate the different materials and objects within the character.
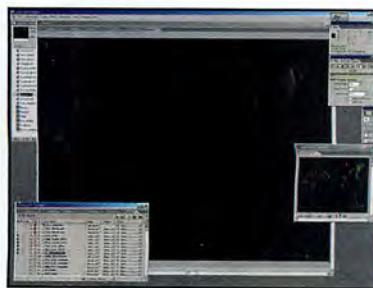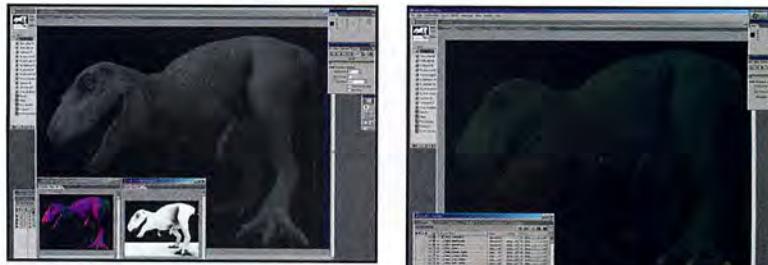
Build a library
Always save your shaders to a library. Name them well so that they will make sense to you two years from now.

Captured images
Internet images are usually low resolution, making you wish you had better ones. Build a library of the ones you have, and keep building. You will most likely, if you haven't already, started using HDRI (high dynamic range images) or IBL (image based lighting) techniques. Build an image library for this as well. Again, NAMING is essential.


9 Ambient occlusion Add the new composited lighting together with an ambient occlusion pass to give you the internal contact shading. Ambient occlusion is the pass that will really make your object start looking like it's actually in a world, not just a CG render. Handle it with care; your render passes are not to be slapped on. They are building blocks and need to be handled with artistic sensibility. Make sure you create a pre-comp of your shading so you can use it separately later.


10 Add shading By adding the shading we start to see the form of the character. Remember to go back and forward to alter your look as you go along. You'll quickly start to notice that your colour is a bit off when the shading is added. You may also notice that the shading is too heavy. Keep adjusting the individual light source shading values.

11 Build specular You rendered your multi-specular pass without shadows (because of the added render time), so now you have to subtract the shading pass from the rendered specular pass to get a proper usable specular layer in compositing. When using the multi-specular pass, remember to tweak the specular separately to get the desired effect. Always think of ways to cut render times.
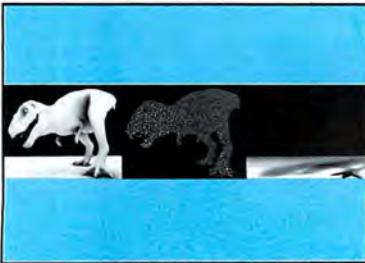
Render passes The first step of this process is to not think of your 3D renders as simply beauty and effects passes. You need to get down and dirty with the passes. This example is pretty easy to carry out within the fourteen steps here, but do make a mental note of this – the passes are simple. In this process the passes will be heavily used and re-used to create the look in compositing. Here, we've created ambient occlusion, floor shadow, and a texture pass.

Create several multi-passes Multi-light pass separates red, green, blue channels for key, rim, and fill lights in traditional CG lighting. You can use the channels to get as much out of one render as possible. The idea is that you only really need a greyscale matte to give you the information you are after, so use each channel for the mattes. You can look at passes such as transparency, volume density, edge detection, facing ratio, contact shadow, dirt and scratch, and ramp channel.

Basic look Start by adding whichever is the most significant pass for your desired look. For this example we'll start by adding a flat colour pass, using the multi-pass as a base to create colours from. It's worth noting that many artists use a similar approach, but with fewer passes. Everyone has a method, but as a general rule, the more flexibility you have in 2D the better, so split the passes down to the 'true elements'. You'll soon find that it helps you instead of hindering you.
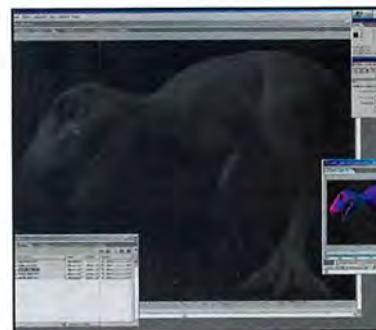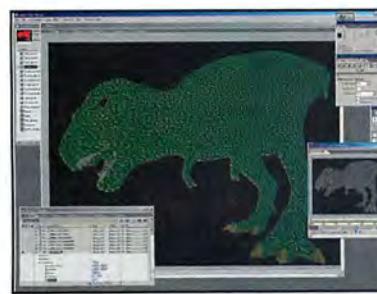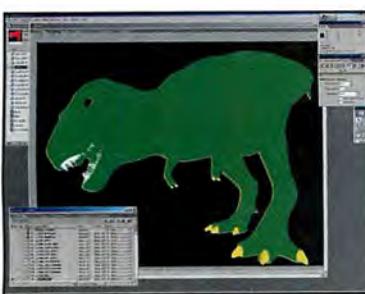
Create colour Start adjusting the different parts of the body. As you can see, the flat colour was far away from the result we want, but in 2D it's easy to fine-tune it. Basically, you extrapolate each individual object and change its colour to what you're looking for. For most objects you want colour texture to work with, but you use the combination of your multi-pass and the flat colour (containing the colour texture) to tweak it to your liking.

Add texture We add a bit of texture to our character – again, using the multi-pass to control the look on different pieces as well as combining it with other passes such as shading passes and facing ratio passes. Subtle differences are what will sell it to the viewer. It makes the look of the object more rich and detailed without adding geometry to it. The effect in our example is very subtle, but certainly noticeable.

Build shading When you render your multi-light pass, it gives you a red channel for the rim, blue for the key, and green for the fill light. The beauty of this approach is that you can now decide how strong each light source is in a compositing package. And while in the comp tree, you can tweak it easily in real time.

References
Have something in front of you. Study it in different lights. Take it with you to the bathroom. (Oh, come on, you know what I mean.) What is it that makes it look the way it does? Break those thoughts down into render passes. Build them up in the composite.

Opinions
Use other people around you for opinions. Have them look at your reference and try to describe what it is that makes it look the way it looks. Have them comment on your composite when comparing it with your reference. Soon you'll find that most changes you can do in 2D without re-rendering passes in 3D. Think of them as clients looking over your shoulder. No name calling, though.

Add specular We add specular to the mix, again, using the multi-pass to control the look on different pieces. The specular is the pass that most people use to identify if an object is CG or not, so we want to make as much as we can to break it up.

Floor shadows The beauty pass has been recreated in compositing, but you also need to set it into a world. We use the ambient pass and the floor shadow to create a proper floor shadow pass. By integrating the beauty into a new composite we can alter its overall look to finally integrate the character into the environment. We add the shadow passes on the background, and combine the floor shadow and the ambient occlusion pass.

Floor reflections We add reflections of our character in the background environment. We have broken down our reflection passes as well so that we can reuse the character beauty comp. Usually, just tweaking a few things here will make all the difference, so study the results. This is a very basic example of this method. At Framestore CFC, we've used the method on projects such as our recent 'Cow & Bear' ads and will no doubt use it on many more projects in future. ■

MAKE LIGHT WORK

With an understanding of three-point lighting, a scene can be lit to portray many different moods. Master the basics with the sample chapter from Essential CG Lighting Techniques on this month's cover CD, then refine your skills with this tutorial **BY DARREN BROOKER**

ON THE CD
Book chapter (PDF format)
All supporting images and files
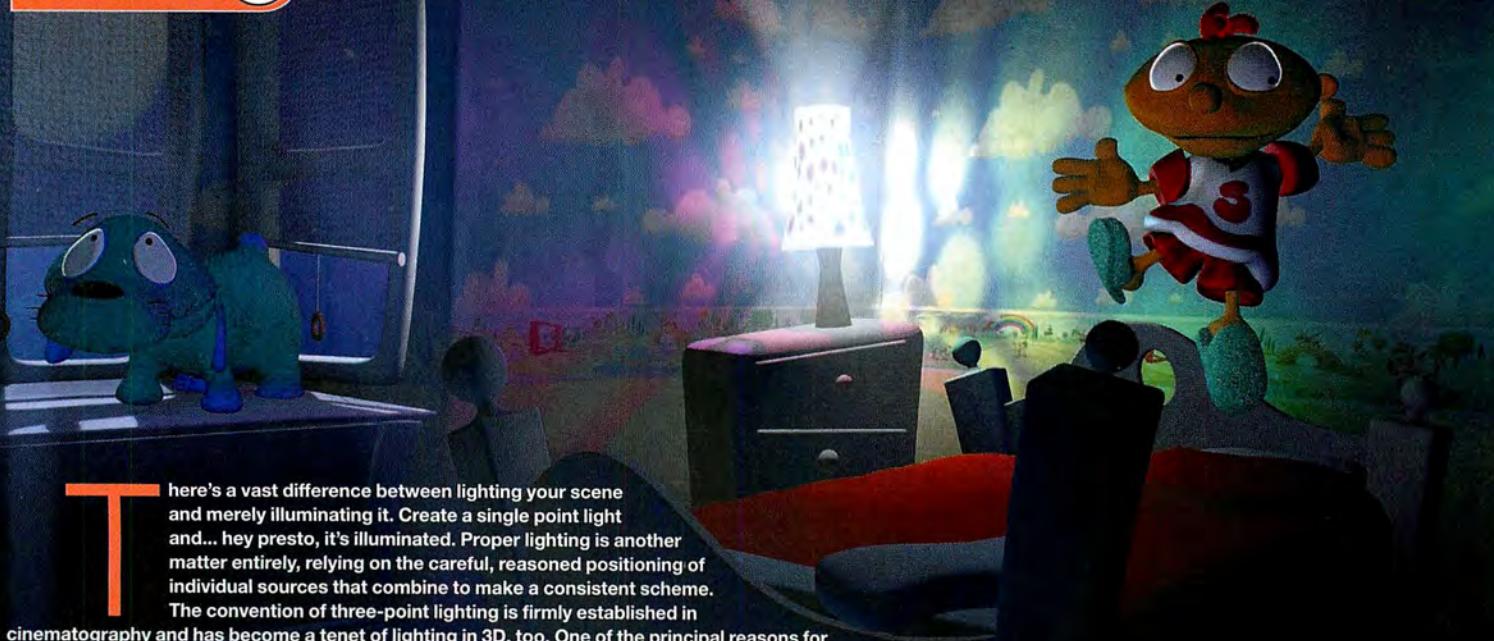
There's a vast difference between lighting your scene and merely illuminating it. Create a single point light and... hey presto, it's illuminated. Proper lighting is another matter entirely, relying on the careful, reasoned positioning of individual sources that combine to make a consistent scheme. The convention of three-point lighting is firmly established in cinematography and has become a tenet of lighting in 3D, too. One of the principal reasons for this is that its use can help to emphasise a subject's three-dimensional nature, something that's obviously desirable in 3D graphics. However, the main role of lighting is to produce a final look that underlines the mood of a scene, creating an all-important emotional connection with the viewer.

Lighting needs to operate on an emotional level to achieve several things: it should elicit a reaction from your audience that is consistent with the storyline and it should guide the viewer visually to the focal points of a scene, while reinforcing the desired atmosphere and providing your audience with clues to its characters, locations, and times of day and year.

This *3ds max* tutorial aims to do just this, examining one scene's challenges and taking each light one at a time, demonstrating how a lighting scheme is built up steadily. In doing this, it picks up where the sample chapter that can be found on our cover CD ends, so if you are struggling to understand the concepts behind three-point lighting, run through the PDF files on the disc to familiarise yourself with the basics. With the fundamentals of three-point lighting under your belt, you should be able to bring any scene together into a visually cohesive and atmospheric whole.

BY: DARREN.BROOKER@TERRA.ES   **WEB:** WWW.FOCALPRESS.COM

Darren Brooker is an award-winning freelance 3D artist currently working at Red Vision in Manchester. He is also the author of *Essential CG Lighting Techniques* (a chapter of which we've placed on this month's CD), published by Focal Press. Additional character design by Prash Patel (pra5h@hotmail.com) and modelling by Prash Patel and Paul Campbell (paul.campbell@chf.co.uk) at Cosgrove Hall Digital

Lens effects

Lens effects can be used to provide cheesy lens flares, but they can also be used in the context of lighting. In the Rendering Effects dialog, add a Lens Effect, then specify the Glow component. In the Glow Element rollout give it a Size of 1.5 and an Intensity of 100. Next, via the Options tab, check Effects ID and give this a value of 15. Now set the BedsideLampShade material's Material Effects channel value to match. Render now and the light will appear to glow.

MAIN LIGHT The bedside lamp is made up of more lights than you think…

1 It's generally good practice to start with your scene's key light, which is the most dominant light in a scene, and as such is the main shadow-casting source. For this, we'll need four separate light sources and some trickery with materials in order to enable it to project its pattern onto the walls. First of all, create an Omni light and centre this on the LampShade object.

2 Rename this light to OmniLamp, set its shadows to Raytraced, and give it a Multiplier of 1.0 and a slight orange tint. If you render now you'll see from the unconvincing results just why this simple light fitting is made up of four separate lights. It doesn't decay realistically, so set the Far Attenuation to 500 and 900 respectively, check the Use box, and render again.

3 The illumination looks much more realistic around the area local to the lamp, but realistic is not always what we want, so we're going to use one of my favourite max tricks to cheat the lamp's illumination. Using the Non-Uniform Scale tool, scale down the light to 60% along its Local Z-axis to squash its zone of illumination down, then render once more.

4 Our lampshade still lacks any kind of illumination, so open the Material Editor and find its material slot, named BedsideLampShade. Click the Standard swatch and change this to Raytrace. In the Basic Parameters rollout, check the box for 2-Sided and uncheck Reflect. Alter the Specular Level and Glossiness settings to 20 and 10, respectively.

5 Within the Raytracer Controls rollout, clear both the Raytrace Reflections and Refractions check boxes. Now in the Maps rollout, allocate LampProjector.jpg to the Diffuse and Fluorescence channels, and within the Extended Parameters rollout, increase the Fluorescence Bias to 1.0. Render now, and the lampshade appears lit, but that's about all!

6 To correct this, put LampProjectorAlpha.jpg into both the Transparency and Luminosity channels. Rendering now gives us our projections, but they reach too far, so reduce the Far Attenuation to 300 and 550, respectively. We now have projections without general light, so clone a copy of the light and turn off its shadow casting, Exclude the LampShade object and rename this OmniLampIllumination.
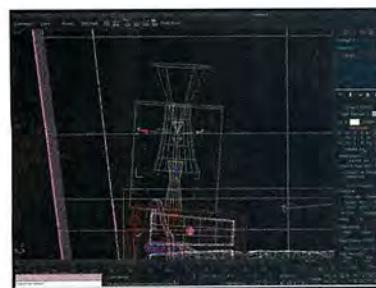
7 Finally, to bring out the colours on the surrounding furniture a little more, scale the projecting light up to 130% along its Local X and Y axes. Now Create a Free Spotlight located just above the lamp's omnis and rotate this so that it's pointing out of the top of the lampshade. Carefully set the cone to coincide with the opening at the top of the lampshade.

8 Give the light a Multiplier value of 0.4 and set the Far Attenuation to start just outside the lampshade and end just beyond the ceiling. Around 100 and 450 should do the trick. Repeat this process, creating another spot that points downwards, with the same Attenuation values. Rendering now should give us two nice illuminated patches.

9 To give these lights some substance, add a Volume Light within the Environment dialog. Give the Fog Colour a slight yellow tint and set the Attenuation Start and End values to 70 and 55, respectively. Check Use Attenuation Colour and set this to a warm orangey colour. Hit the Pick Light button and add the top spotlight. Add another Volume Light, for the bottom spotlight, but with Attenuation values of 100 and 100.

Shadows

Though you might consider shadows something that things get lost or hidden in, this element of lighting is vital in terms of composition, spatial relationships, and contrast. Shadows vary enormously in shape, form, and quality with an environment's illumination. The human eye takes a cue from shadows not only in judging where a light source is located, but also what an object is made of, how far away it is, and how it relates to its surroundings.

AMBIENT LIGHT Next we'll look at the moon and our other less dominant lights…
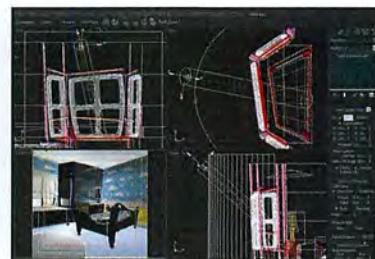
10 Our next most influential light in the scene comes from the moon. Setting up this light involves a similar process to our lamp's omnis, as we want the blinds to be slightly opaque, letting in light. This means one thing: a raytraced material on the blinds and raytraced shadows. First, to give us some idea of the sky, find the material NightSky and give it a 100% Self-Illumination value before rendering.

11 We need to make a light representing this moon, so create a Target Direct light in the Top viewport roughly halfway along and just outside the curved NightSky object with the target about midway along the ottoman chest's front edge. In the front viewport, move the light up to almost the top of the curved sky object and align the target roughly with the top of the ottoman.

12 Rename this light DirectMoon and give it a pale violet colour, setting its Multiplier to 0.75. Make sure that Cast Shadows is turned on and set the shadow type to Raytraced. Using the Exclude function, remove the NightSky object from both illumination and shadow casting. Now, right click a viewport label and change its view to DirectMoon, then maximise this viewport.
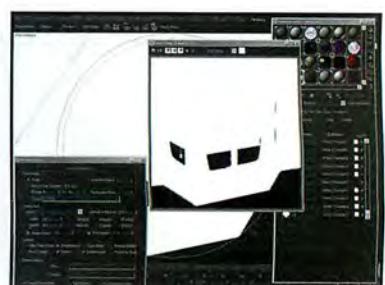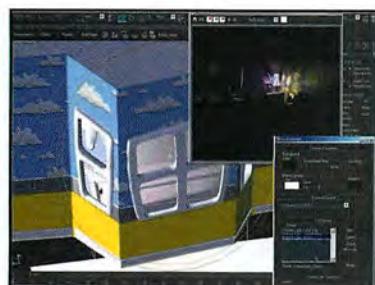
13 Using the Uniform Scale tool, scale up this light so its cone just covers the windows. You should find that 800% just about does it. Render now, then adjust the light's position until the pool of light that the moon is throwing across the chest and floor forms an interesting pattern. Now add a new Volume Light effect and pick DirectMoon as the light.


14 If you render now, you'll see that the volume light doesn't conform to the window's openings, so to cheat this we need to first render a view from the light itself to use as a Projector Map. To help us here, make a pure white and a pure black material, giving the white a 100% Self-Illumination value and checking 2-Sided. Hide all the scene's geometry except the windows, bedroom, and blinds.


15 From the Edit menu, select Hold, then apply the white material to the blinds and windows. Now, find the bedroom material, and at the top level, drag the black material to the carpet slot (number 22) and the white material into every other slot. Now set your render output size to 512 x 512 and render from the DirectMoon view. Save this file as MoonProjector.jpg.
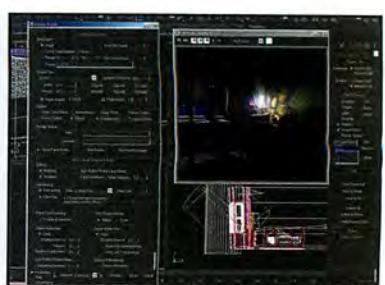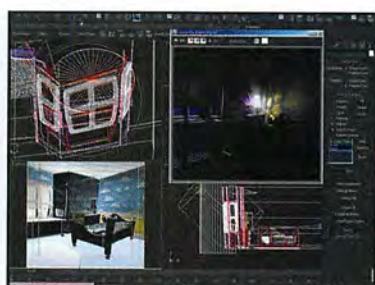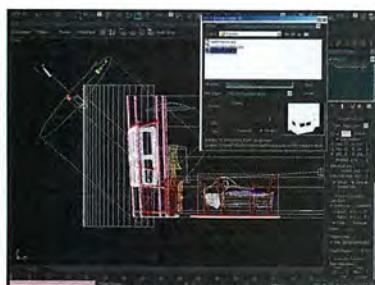
16 From the Edit menu, choose Fetch. Now clone a copy of the DirectMoon light, renaming it DirectMoonVolume and changing its shadows to Shadow Map. Turn on Far Attenuation, and set the start and end to just above and beyond the room's floor. Now, within the Directional Parameters rollout, hit the Projector Map button and select the MoonProjector.jpg file.

17 In the Environment dialog, remove DirectMoon from your new volume light effect so that just your new light remains and drag your light's colour to the Fog Colour swatch. Check Use Attenuation Colour and set the Attenuation Start and End values to 100 and 80, respectively. Rendering now will show you just how much this effect adds to the image.

18 Unfortunately, this effect also adds a lot to the render time, too, so for the moment at least, disable all of these effects within the main Render dialog by clearing the Atmospherics box in the Options section of the Common Parameters rollout. We're now ready to place individual lights within the room to bring out its details, which are currently lost in the dark.

Blue fills

Fill lights that have been coloured blue can be used to cheat in some illumination where darkness is the desired look, but where visibility is also needed. The blue colour provides some illumination, but does not break the illusion of darkness because of the way our eyes adjust to low-light situations. Indeed, blue light actually strengthens the illusion in some cases because of the way it desaturates human skin tones, mimicking the way in which our eyes adjust to dimly lit situations.

FILL LIGHTS We'll finish by adding the visibility we need without breaking the darkness
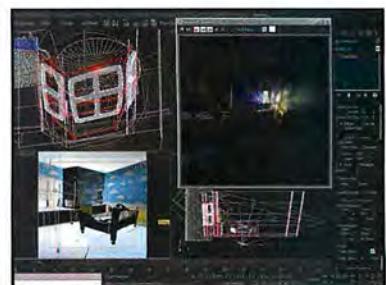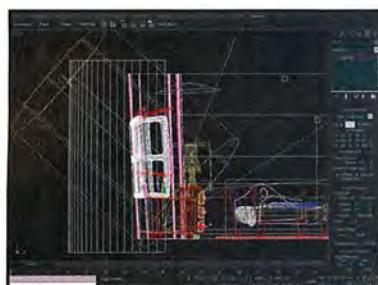
19 Begin with the light that would bounce off the lid of the chest, the floor, and the ceiling, illuminating the bedroom. For this we'll use spotlights. Create the first one in the Front viewport towards the chest from the centre of the floor, pointing towards the middle of the ceiling, though underneath the floor, at about Z: -130. Set the Multiplier to 0.2.

20 In the Top viewport, place the light and target so that they are aligned with the DirectMoon's direction. Give the light the same colour as the rug light's bouncing off (R:113, G:121, B:181) and clear its Specular component, since light bouncing off surfaces does not have this quality. Also, turn off Cast Shadows if they are on.

21 Now set the Far Attenuation to just above and below the ceiling, say 1,000 and 3,500. Finally, give the light a wide Hotspot with an even wider Falloff value so the light falls off softly. 120 and 150 should do the trick. If you render now, you can see that this fill light illuminates the previously dark areas without breaking the illusion of night, because of its colour.

22 Finally, use the Non Uniform Scale tool to scale it by 130% along its local X axis, so its illumination is stretched along the length of the room. Rename this SpotFloorBounce. Now, create another Target Spotlight, named SpotCeilingBounce, located towards the bedside lamp from the middle of the room and pointing at the centre of the room, so that it's looking towards the camera.
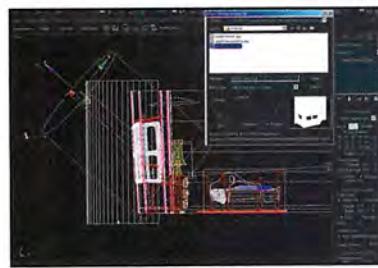
23 Again, clear its Specular component and turn on its shadows. Give this light the same Far Attenuation, Hotspot, and Falloff values, but with a slightly weaker Multiplier value, say 0.1, and a bluer colour than the last light. We want the shadows that this light casts to be fairly soft, so the shadow map doesn't need to be massively large: say 1,024.

24 Change the Sample range setting to 6.0, which will blur the shadow map, giving us softer shadows and allowing us to get away with a smaller shadow map than we'd need for sharper shadows. This gives us a nice dark area under the bed, but the room's still too dark in the shadow areas, so we need to introduce some blue fill lights to cheat some light in to these areas.
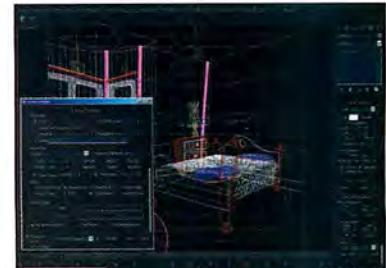
25 Create an Omni light in the top right corner of the room, as seen from the Top viewport. In the Front viewport, move this to about a third of the way up the room. Set its colour to a pure blue with a Saturation value of about 170, set its Multiplier to 0.1, and set its Far Attenuation to start just beyond the end of the bed and end beyond the bay window. Rename this OmniFillRight.
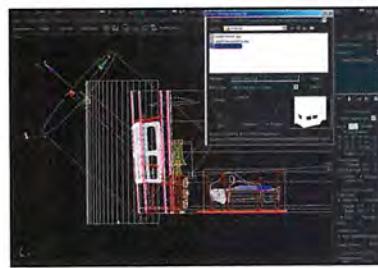
26 Create another fill light with the same settings in the centre of the bay window, midway to the ceiling from the top of the chest. Give this a Multiplier of 0.3 and set its Far Attenuation to 150 and 400. Rename this OmniFillBay. Finally, create another Omni light directly above the rug with a Multiplier of 0.3, again with no shadows and no specular component.
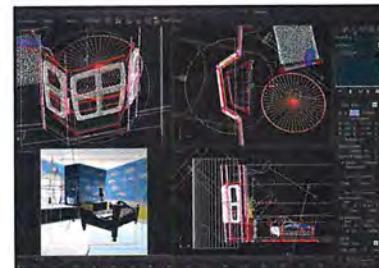
27 Set its Far Attenuation to 200 and 500 and you're about done. Using the techniques you've learned, add one final fill light over the bed to bring out some detail there, then turn the Atmospherics back on in the main Render dialog. You might want to add the glow described in the margin on the first page of this tutorial before hitting the Render button. ■

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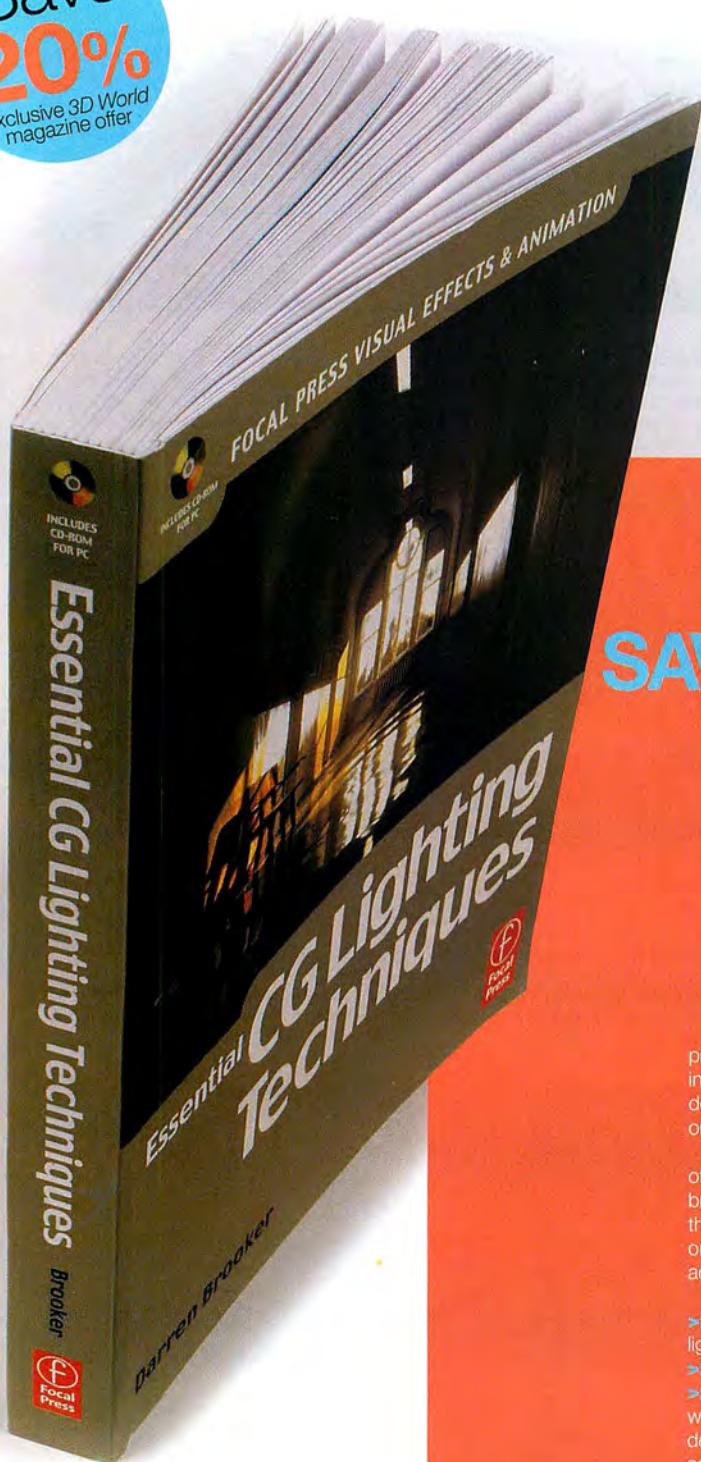
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WIREFUSION 3

How do you create 3D Web presentations with streaming video and sound – but without using a browser plugin? Simple: you use WireFusion 3…

BY SET LONNERT

WireFusion enables you to define the logic of a Web presentation visually by dragging predefined objects into a script area and then connecting them with wires. In the latest version you can extend *WireFusion* with plugins, which are sets of one or more specialised objects. *WireFusion's* publisher, Demicron, has produced four plugins: *WF-3D*, *WF-Video*, *WF-MP3* and *WF-SlideShow*. The most interesting of these for our purposes is *WF-3D*, an advanced Web 3D solution, which has a very small 3D player – it's only 25Kb, but the quality is surprisingly good. With *WF-3D*, Demicron has obviously focused on Web-based product presentations in 3D, rather than walking around in 3D worlds or decorating rooms, and the idea is that you create your virtual products in any 3D modelling software capable of exporting to VRML, such as *3ds max*, *plasma*, and *Maya*.

Once the model is imported to *WF-3D*, you can easily control object appearances, camera positions and animations, add reflection maps, and so on. All the settings can then be animated while the presentation is running, thanks to the tight integration with the main program. A very special feature is the Texture object, which enables you to add interactivity and animations to your textures. You simple replace a static texture with a ready-made *WireFusion* presentation. With the *WF-Video* plugin, you could even display a full-motion video as a texture on a 3D model – in real time on the Web without any extra browser plugins.

WireFusion 3 isn't just an alternative to *Shockwave 3D*, *Viewpoint*, and *Cult3D* – but also a decent alternative to *Flash* and *Director*, too. Without further ado, then, load the demo from this month's CD and follow our tutorial to see what all the fuss is about.

Set Lonnert produces articles, books, and educational materials, and lectures in the ancient Swedish university town of Uppsala. As well as being a dab hand at *WireFusion*, he's a Java expert and just loves clean code

1 Install the *WireFusion 3* trial software from the CD and start it in Tryout Mode. Next, install the *WF-3D* plugin (wf-3d.wpl) via File > Install plugin, then run *WF-3D* in Tryout Mode.
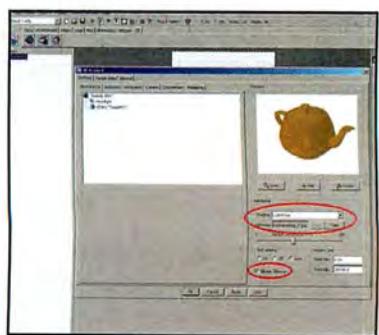
5 From the Shading menu, select Lightmap as the shading method. Then load a new Lightmap image, click '...' and load Catsanddogs_1.jpg, which you'll find in WireFusion3/resources/maps/reflection_maps. Mark the Bilinear filtering box to get smoother reflections and textures (if present).
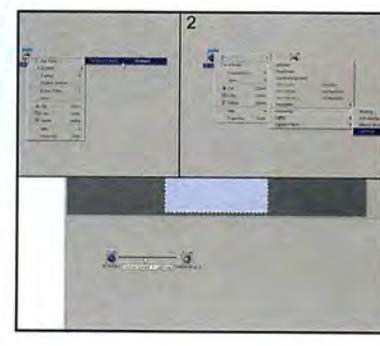
9 The images stored in the Texture Array will be used to dynamically replace the default Lightmap image. To send information between objects you'll need to connect them. Click the small arrow in the upper left corner of the Texture Array object to open its local menu.

10 Make a connection between the Texture Array object (Texture Array > Out Ports > Texture Pushed) to the 3D Scene object (3D Scene > In Ports > Rendering > Lightmap). A wire between the objects indicates that they are connected. Place the mouse over the wire to get the connection information.


11 We'll use JavaScript to push the lightmap images from the Texture Array into the 3D Scene object. Switch to the Environment tab and insert a JavaScript Link object. When its Properties dialog opens, just click the OK button to close it.
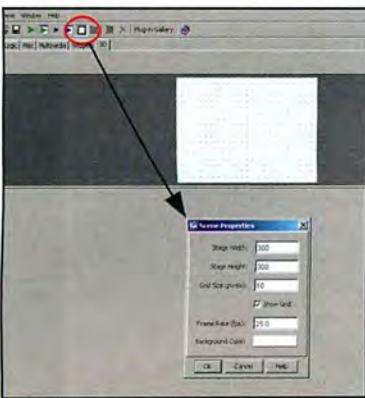
2 In a new and empty project, open the Scene Properties dialog and set the following Stage dimensions: width 300 pixels and height 300 pixels.
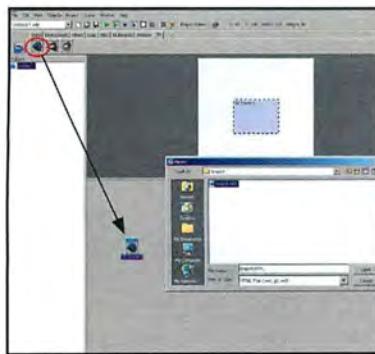

3 Switch to the 3D tab and insert a 3D Scene object into the Script Area. When you drop the object, a file dialog will open. Load the VRML file, Teapot.wrl, found in the *WireFusion* installation directory (WireFusion3/resources/3d_models/teapot).
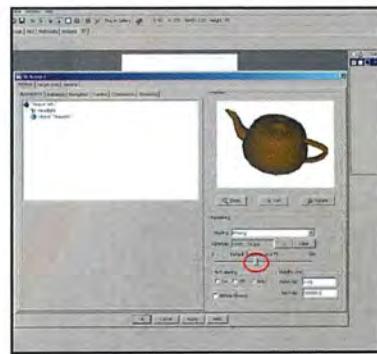

4 The 3D Scene's Properties dialog opens when the VRML file is loaded. Under the Appearance tab there's a Preview window in which you can rotate, move, and zoom your teapot object. Use the Default Smoothness slider to change the crease angle from 0 to 75 (degrees).
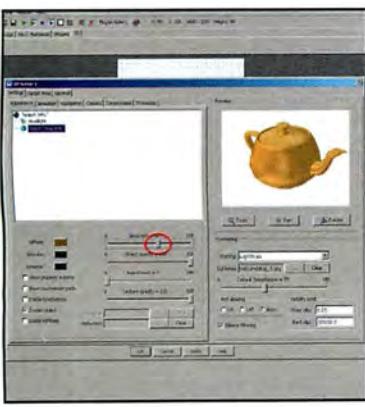
6 Select the Teapot01 object by clicking it in the Preview window, then set its Glossiness value to 60. Click the OK button to close the dialog.
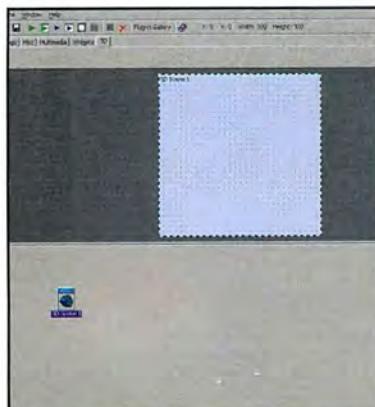
7 Select the 3D Scene object and press [Alt] + [S] to make the bluish 3D Scene Target Area stretch over the Stage.
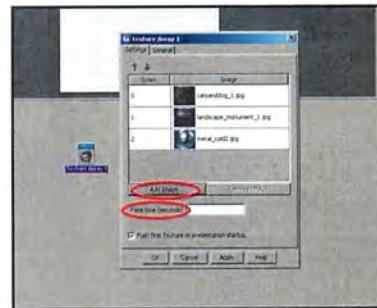
8 Switch to the 3D tab and insert a Texture Array object to the Script Area. When you drop the object, its Properties dialog will open. Set Fade time to 2 seconds, click the Add Image button, and add three images: Catsanddog_1.jpg, Landscape_monument_1.jpg, and Metal_cold2.jpg, which you'll find in WireFusion3/resources/maps/reflection_maps.
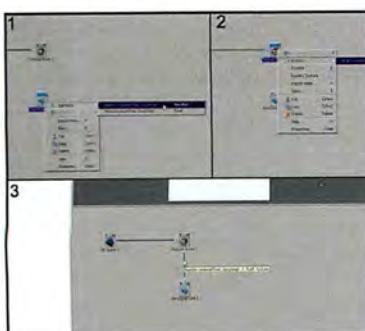
12 Make a connection between the JavaScript Link object (JavaScript Link > Out Ports > Number received from JavaScript) to the Texture Array object (Texture Array > In Ports > Push Texture). Numbers sent from outside the presentation will now enter the Texture Array object via the JavaScript.
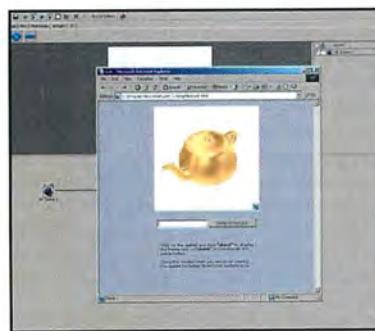
13 Now preview the presentation in the browser. Click the Preview presentation in browser button or press [Ctrl] + [F9]. When the browser starts, enter a number between 0 and 2 (the Texture Array index number) in the text field and then press the Send to my Link button.
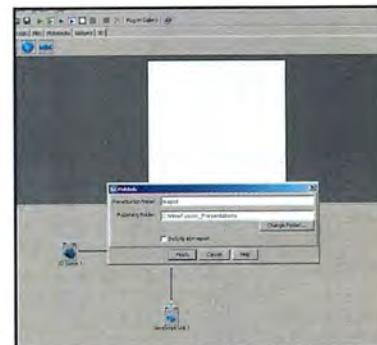
14 Close the browser and save your project via File > Save Project As. To publish the presentation, choose File > Publish, then upload your published HTML file and the accompanying resources directory to your Web server. Done! ■

GOING UNDERGROUND WITH TRUESPACE

Create this menacing underground scene with the full copy of trueSpace3 from our cover CD. Part one: building the models

ON THE CD
trueSpace3 (full version)
All supporting images and files

TrueSpace3, originally released in 1997, was the third incarnation of Caligari's rather unusual 3D animation package. If you haven't seen its predominantly icon-driven interface yet, you're in for a surprise: you'll either love it or hate it. But take a little time to understand the way it works and you'll find that it's incredibly intuitive, logical, and productive.

TrueSpace3 is built on the selection of spline and polygon modelling tools of earlier versions, adding live skinning with metaballs and plastiform objects, making character modelling a lot easier and quicker. It also has a quality render engine and support for *trueSpace* extensions (TSX) including particle systems and 32-bit Adobe-compatible plugins. Its ability to export to AutoCAD (DXF), ASC, and VRML formats made it a valuable asset to designers, hobbyists and Web developers alike.

Add to that the animation tools, which seamlessly integrate keyframing, collision detection, dynamics, and IK, allowing you to manipulate a figure simply by shaking its hand or to animate a walking character by keyframing the figure's footsteps. IK is also integrated with Dynamics – including degrees of stiffness for each joint.

FALLING PETALS

Physics allows objects to have the properties of real materials, such as wood or rubber, with weight, elasticity, torque, and velocity. You can also apply gravity, wind, and other forces, then just click Play to see objects falling, slowing down from atmospheric density, and colliding with each other. You could animate a petal dancing in the wind simply by dropping it.

TrueSpace3 offers an excellent introduction to 3D modelling, rendering, and animation. It delivers impressive results very quickly, and unlike many packages, the *learning curve is* relatively shallow. Join us in our exploration of its features over the next two issues, creating this beautiful image in the process. This month, we'll be creating the models; next month, we'll cover texturing and lighting.

BY: ANDY KAY   **WEB:** WWW.ANDYKAY.ORG.UK

Andy Kay is a UK-based freelance artist who has been using *trueSpace* to create still images since its early days, mainly for product visualisation and architectural illustration

Quick tips

01 In the first section of this tutorial we're going to create the light fittings, fire alarms, junction boxes, and the basics of the conduit. Keep track of your work and save objects and scenes regularly.

02 *TrueSpace 3* must be installed to the root C directory and not a sub folder. If you install it to any other folder it's possible that the renderer will crash under certain conditions.

03 File names for global environments and textures must be no longer than eight characters, and the files must be located in the textures directory of *trueSpace 3*. Using file names longer than eight characters or outside the specified directory may, again, cause the renderer to crash.

04 Installing certain plugins can corrupt the display settings – particularly Maximise and Minimise. To correct this and return *trueSpace 3* to its default settings, delete the Truespace.cfg file in the installation directory. As soon as you restart *trueSpace*, it will create a new configuration file.

05 The icons often have more than one function. If one has a red tip in the corner, right click it to open a numerical dialog, or left click and hold to open a pop-up context menu.

06 The *trueSpace* interface may seem a little unusual at first. It's easily customised, though, using the Preferences and the Display Options menus and dialogs.

SETTING THE SCENE A quick overview of the workspace and tools
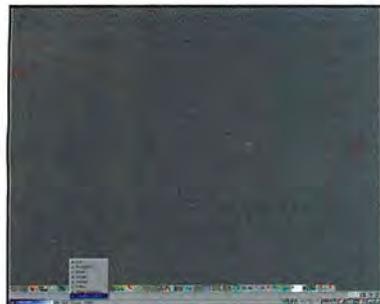
1 With *trueSpace*, all operations are carried out on a single screen: modelling, texturing, lighting, animating, and rendering. The Help bar will display the name of icons as you hover over them. Click the Groups menu and add Object Navigation, and you can add these tool groups as and when you need them.

2 Although we'll deal with texturing in next month's tutorial, we'll apply some materials this month just to get the feel of the Material Editor. It can be accessed by right clicking any of the paint icons. The Material library can be used to store your new textures.
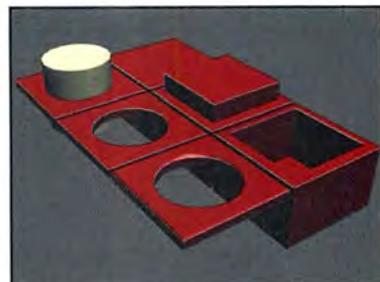
3 The Object Info dialog is accessed by right clicking the Object Tool icon. Keep the Help bar activated along with tool tips until you are sure of each icon. *TrueSpace* icons have corner flags to inform you of pop-up menus; left and right clicks open different menus and dialogs.

4 Load a cube and scale it to create a rectangle. Load another cube and a cylinder, boolean union them and scale them to form the end cap. Next, position it, then copy and place it at the opposite end. Scale another cylinder to create the bulb, glue everything together and save it as 'Strip light'.

5 Scale a cube and subtract a cylinder. Using the point edit tools, bevel the top and bottom faces, load another cube and bevel the top face – right click the Bevel tool and change the values to form a bevel of 80 degrees, then adjust the size. Re-select the inner face and sweep it. You can then move the new face downwards using the Point Move tools.


6 Load another cube and scale it so that it fits inside your hollowed box. Now, with the horizontal text tool, add the word FIRE into the scene, sweep it, move its axis to the centre of the object, then scale and position it to match the alarm box.

7 Load a six-sided cylinder, bevel the top and bottom faces to form a nut-shaped object. Now, load another cylinder – this time 16-sided – and align it to form the basis of a tapered cylinder using the point edit tools to form a tapered cylinder. Glue it to the nut and scale it to match your alarm. Save the object as 'Conduit union' then glue it to your fire alarm and save again.

8 The conduit junction boxes are made in exactly the same way as the fire alarm casing – add three copies of the union object to each. We'll make the conduit and its brackets later on in the tutorial.

9 The perfectionists among us may want to add screw heads and so on to the fire alarms and junction boxes. These can be created quickly and easily using Point Edit, Bevel, and Boolean tools.

TUTORIAL

## BUILDING THE TUNNEL Working with the axis and grid tools
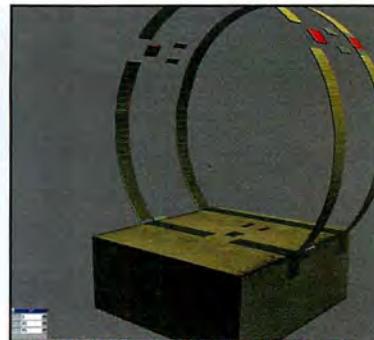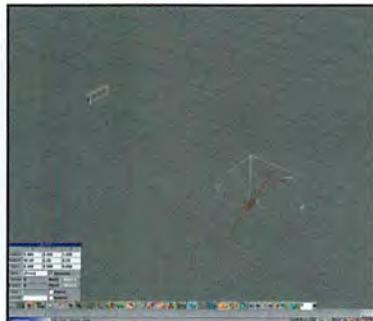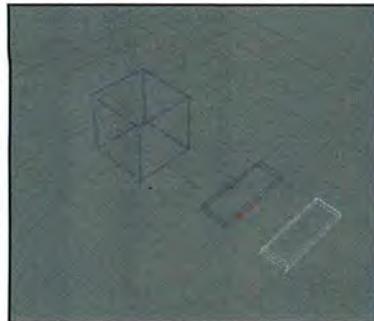
10 We could use a texture map for the tunnel wall, but for the purpose of this tutorial we'll create it using geometry – it stands up better to close inspection and will give you a chance to use a few more of the tools. Load a cube and scale it until it looks tile-shaped.
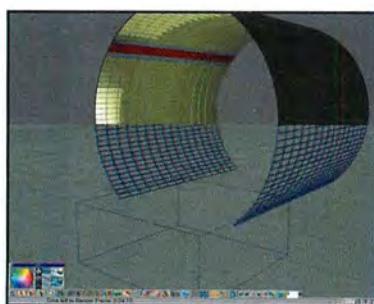
11 Using the Bevel tool, apply a bevel to the top face, and rotate it so that it's vertically aligned. Move it along the Y axis to -3.6 metres, then select its axis and move that back to 0, leaving the object in its current location – clicking the Axis tool again will hide the axis.
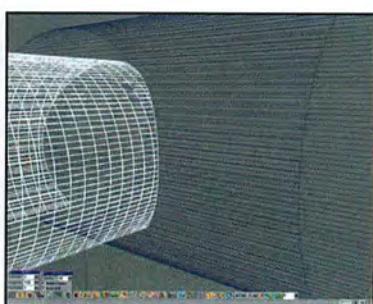
12 Set the grid rotation to 3 degrees on the X axis and make copies of your tile until you've created one section of the tunnel walls – it's a good idea to add your tunnel floor here to set your scene up properly.
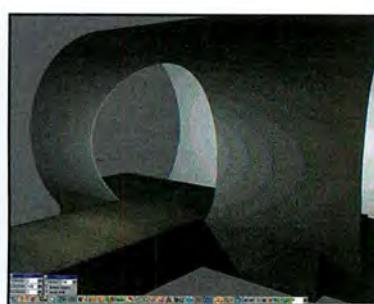
13 Glue the tiles together to form the different coloured sections of the wall. Paint them to identify the tile colours. Make copies and move them until the section is five or six tiles deep, then glue it all together, maintaining the groups and saving the object as Tube section.
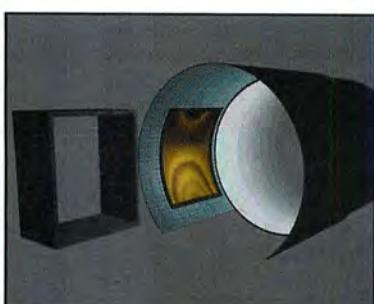
14 You can now start to build up your subway section by copying and moving the sections to create a tube. When you reach the end of the tunnel, load another cylinder and position it at 90 degrees to your tunnel and subtract it from the final section. Make sure Keep Drill is checked in the Booleans dialog.
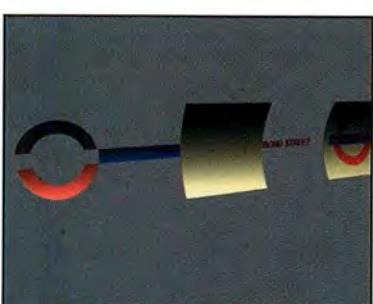
15 Copy your cylinder, scale it, and subtract it from the larger one to create a tube. Subtract another cylinder from one side to create the aperture where the tunnel meets the platform. Extend your floor section a little either side of the platform aperture. We now have a subway and platform.
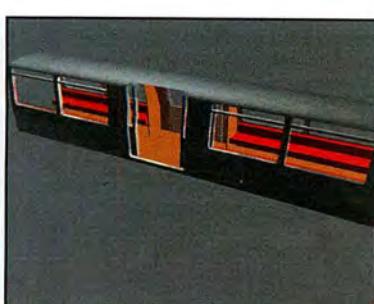
16 To make the poster frames we need a hollowed cylinder slightly smaller than the tiled section. Then load a cube primitive. Subtract another cube from it to leave a square frame, then boolean intersect that with the cylinder – the poster being created in exactly the same way.

17 We want the tube station signs to stand slightly proud of the walls, so build them using the text tools and boolean intersect like we did the posters. Paint the various sections of the signs in the appropriate colours and glue them together.

18 Make yourself a train to stand at the platform. It doesn't have to be a full-length carriage – the level of detail here is up to you. Just make sure it's hollow and it has window and door apertures, as we're going to put lights in here to cast light down the tunnel.

PUT EVERYTHING TOGETHER Organise the objects to create the scene

Quick tips

01 As you construct the tunnel, scale the objects you create to match the grid units you've specified. It makes moving things around precisely a lot easier. And since most of the time you'll be using either side or top views, working in wireframes is probably best.

02 For the characters we're going to use transparency maps. Many of you will have access to character libraries or character software. If you use those, the paint tools in *trueSpace* give you the ability to customise them with paint face, vertex, and even 3D paint. Use the hierarchy tools to navigate and isolate the various sections of your figure for painting.

NEXT ISSUE

In the second part of this tutorial, which you can find in issue 34 of *3D World*, we'll be showing you how to light, texture and render the scene. Lighting and texturing use certain advanced features not found in *trueSpace3*, so next month we'll be using version 6, a demo of which can be found on the cover CD. You can also take advantage of our reader offer to upgrade your copy of *trueSpace3* for just £199.
■ See page 64 for details.

19 Open a new scene and load a couple of sections of your tiled walls and your strip-light model. Scale it to fit and position it against the ceiling. Run a couple of small cylinders along either side as conduits. Make yourself some small brackets to wrap around these new cylinders and 'fix' it to the ceiling.

20 Load the fire alarms. Position and scale them as you did the lights. Using the Move Down in Hierarchy tool and Point Edit tools, select the top face of your conduit adaptor and separate that face. Select the new object and create a new cylinder with the Lathe tool that follows the contour of the tiles.

21 You can now copy, rotate, and move that new conduit to link the lights, fire alarms and so on to the tubes on the ceiling, either side of your lights. Now load the junction boxes, scale them and position them wherever the conduits cross.
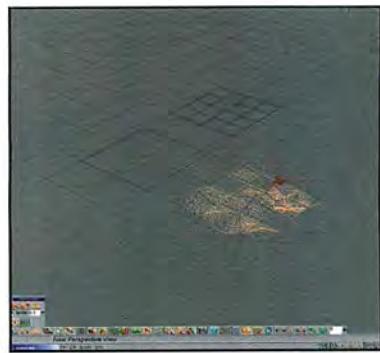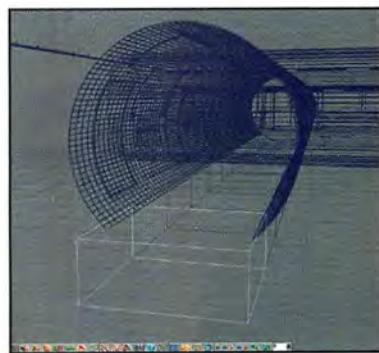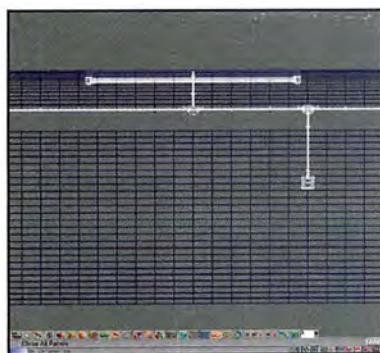
22 Make the tunnel electrics in a section that's in proportion to your tiled sections and within a suitable grid setting – that way copying and pasting it will easily match up along the length of the tunnel.

23 Once the tunnel is complete, have a look around it, making sure all the sections are complete and everything matches up smoothly – save each section separately as objects and save the scene with the tube complete.

24 For the litter we can load a plane primitive and create objects of various shapes using the Quad Divide and Sculpt Surface tool. Copying, scaling, and rotating will create a random look.

25 Alternatively, use a particle system such as Particlez.tsx found in the tsx folder in the *trueSpace3* directory and use a few of the larger sculpted objects to add interest when we render the final scene.

26 Load a plane primitive and position it at the end of the tunnel – we'll apply a transparency map to this to represent a person. Position another one halfway down the tunnel for the other person in the scene. Naturally, you can use real models here, but the choice is yours.

27 That's the scene constructed. Once again, check everything and then save. At this point you can add any extra details you like. Next month we'll look at lighting, texturing, and rendering in trueSpace6. ■

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Q&A

RIGHT **You've seen this little fella before, but the model isn't important: feast your eyes on the light**

ON THE CD
Supporting files for this Q&A

3ds max

by PETE DRAPER

QUESTION

"How do you use HDR images in max 5 without plugins? I can't get it to work"

JONAS ANHEDE | via email

ANSWER

Contrary to popular belief, *3ds max 5* can use HDR images, although not in their native format (HDR file type); they have to be converted to floating-point TIFFs. Floating-point TIFFs were introduced to *max* as a loadable file type in version 5. This floating-point feature allows a high dynamic range of luminance values and colour, and has now become a standard in the industry. It's not only used within 3D applications, it's also used widely in conventional photography, digital photography, and film, where image manipulation is required.

Before the practical, a little theory is necessary. For those who don't know yet, HDR images are used to accurately illuminate a scene based on the 'light' from the image. For example, say you had an image of woodland with the light streaming through the branches and leaves or an image of an interior with the light coming through the windows: you could use this image not only to provide a background, but to illuminate the scene, too.

So what's the difference between an HDR image and a standard photo. Well, not a great deal. They are shot the same way, but to compile an HDR image, you need to take the same photo several times, each with different exposures (with each exposure noted). These images are then combined in a separate program to form one image that contains all the exposure information. Okay, so it's a little more complicated to create a High Dynamic Range image than this, but these are the basics.

MAXIMUM EXPOSURE

So why do we need exposure? The amount of exposure determines how much light is distributed over a scene or in a picture. Therefore, if you took a photo with a short exposure of the trees with light through the branches and leaves, you would almost be able to pick out each individual leaf. With longer exposure, the backlight from the sun or sky would white-out the leaves, leaving a large white splodge. Combining several images of differing exposures allows you to combine them to create an image whose exposure you can adjust in a 3D program. Additionally, reflections tend to pick out the detail contained within whited-out areas, as reflections are not always a precise mirror; something you could not do with a single exposed image.

So how can we capture an environment? The best way is to use a highly reflective ball, or Light Probe. This is positioned exactly where you want your virtual object(s) to sit so that the scene's environment is captured correctly and will therefore be displayed correctly in any reflections contained within the 3D object. It also ensures that any light hitting the surface of the probe will be captured, as the full extents of the sphere will be used. Several photos of the probe would be taken at different exposures, re-jigged in an HDRI program, and then unwrapped (if necessary) and exported as the relevant file type; in *3ds max's* case, a floating-point TIFF.

That said, you don't need to create your own HDR image to use image-based lighting in *3ds max*, or any other 3D program for that matter. There are tonnes of Light Probe images dotted around the Web that are free to download. These are normally in the native HDR format, so they would need to be converted *and unwrapped to be used in 3ds max*. However, if you need to drop a 3D object into a pre-shot scene, you'll need to take Light Probe photos to accurately match the lighting when building the scene in *3ds max*. The Skylight light uses the image as the light source with Light Tracer to illuminate the scene, and the exposure feature can control the amount of exposure the entire scene receives. This can be adjusted and viewed in real time in the exposure rollout in the Environment window.

BY: PETE DRAPER   **WEB:** WWW.XENOMORPHIC.CO.UK

Pete Draper is *3D World's* resident *3ds max* expert who enjoys nothing more than playing with his highly reflective balls and light probe

STEP BY STEP: USE AN HDR IMAGE

You don't need an expensive camera or even a dedicated plugin to use HDR images in max. Here are the basics…
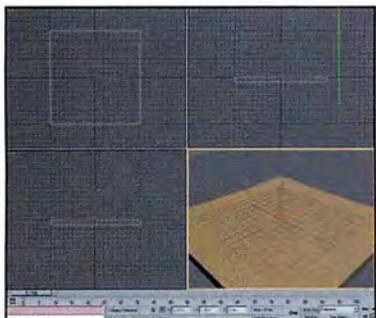

1 Create a box 2m x 2m x -0.1m and position it at 0,0,0. If desired, collapse it to an Editable Poly and chamfer the edges to round them off slightly, else replace the Box Primitive with a ChamferBox Extended Primitive.
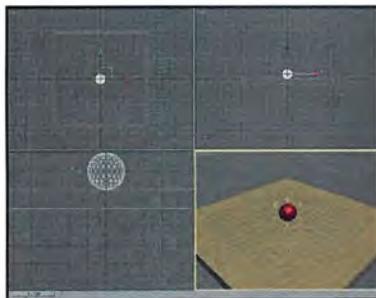
2 Create a Geosphere and place it in the centre of the scene. Offset its position if required so it's just sitting on the surface of the box. Add any additional objects this way if you like, but remember that the more geometry you add the longer the scene will take to render.
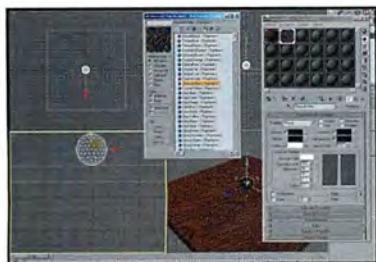
3 In *3ds max's* standard materials library, assign the Wood_Ashen material to the box. Set the U and V tiling of the diffuse map to 3, clear the bump slot and add a Raytrace map to the reflection slot. Set the Raytrace map's spinner value to 20. Check Enable Sampler in the SuperSampling rollout, load the RayTraced_01 material library, and assign the ChromeWhite material to the sphere(s).

4 In a new material, load the kitchen_unwrapped.tif file. Set the Mapping to Environ – Spherical Environment. Drag the Bitmap button to the same material slot (to just show the map) then copy the map to another slot. Rename the copied map, and set the copied map's Blur offset to 0.1.
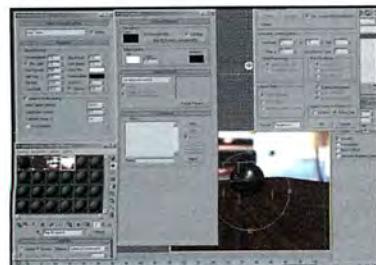
5 Instance copy the first map into the Environment Map slot. Select the perspective Viewport, and in the Viewport Background box, check Use Environment Background and Display Background. Rotate the Viewport so no pinching of the map is visible. In Advanced Lighting, turn on Light Tracer.

6 Create a new Skylight standard light and position it above the scene. Instance copy the second (blurred) map to the Skylight's map slot. In Exposure Control in the Environment window, select Logarithmic Exposure Control and check Process Background and Environment Maps, and Exterior daylight. Finally, set Brightness and Contrast to 100.

3DS MAX TIPS

Tripping the HDRI fantastic is harder than it first appears. Here's a little advice for solving potential problems

01 Creating Light Probes is a little more complicated than we've described here – a more detailed explanation can be found at www.debevec.org. Paul Debevec is the director of the USC Institute for Creative Technologies, and his *HDRShop* program can create, manipulate, and export HDR images and floating-point TIFF's. The one used in our example is from his site, unwrapped and exported using *HDRShop*.

02 Blurring the unwrapped Light Probe image assigned to the Skylight list is necessary to reduce the amount of blotchiness in the resulting render. If you feel that shadows are not cast accurately enough or there's too much grain or blotchy patches in non-reflective objects, try increasing the number of samples and filtering in Light Tracer.

03 Adding a bounce or two in Light Tracer will create a slight glow on the table underneath the chrome balls, as the light is reflected off the balls onto the surface. After rendering an animation, you might notice a slight flickering of the bounced light. You can reduce this by increasing the number of samples and filtering at the expense of render times. You might also want to amend the Adaptive Undersampling settings.

04 We used Logarithmic exposure in our example since it doesn't change on a frame-by-frame basis. Linear and Automatic exposure – although exposure values can be set, which gives a nicer result – are more suited to stills. If these exposure types are used in animations, flickering can occur as the scene moves or objects move on and off camera and the set exposure tries to compensate.

For quick fixes for *3ds max* problems, post your questions in our online forum:
www.3dworldmag.com/3dsmax

Q&A

RIGHT **The *LightWave* interface: daunting at first and potentially confusing, but help is at hand**

ON THE CD
Supporting files for this Q&A

LightWave

by BENJAMIN SMITH

QUESTION

"How can I quickly get to grips with the menu layout in LightWave or even change it to make it easier to use?"

PABLO JESCOBAR | via email

ANSWER

Until version 6, the *LightWave* interface was totally rigid, having a single row of buttons down the left-hand side that couldn't be altered by mortal man short of taking a crowbar to the monitor. Since then, however, the menus have been editable, which has meant that each successive version of *LightWave* has been designed with slightly different menu configurations, which is always a headache for new users.

Unfortunately (or fortunately, if you're one of these new users), the limit of *LightWave's* flexibility is the main toolbar down the left-hand side, the pop-up menus, the graph editor menus and the keyboard shortcuts. You can't move the tools at the bottom of the screen or any of the buttons or options on the panels, nor can you make your own custom panels. Modeller is slightly more accommodating, allowing you to alter the buttons at the bottom the screen.

LightWave 7.5 features six tabs across the top of the screen: Items, Objects, Lights, Camera, Scene, Lscript, and Display. However, many *LightWave* studios have taken
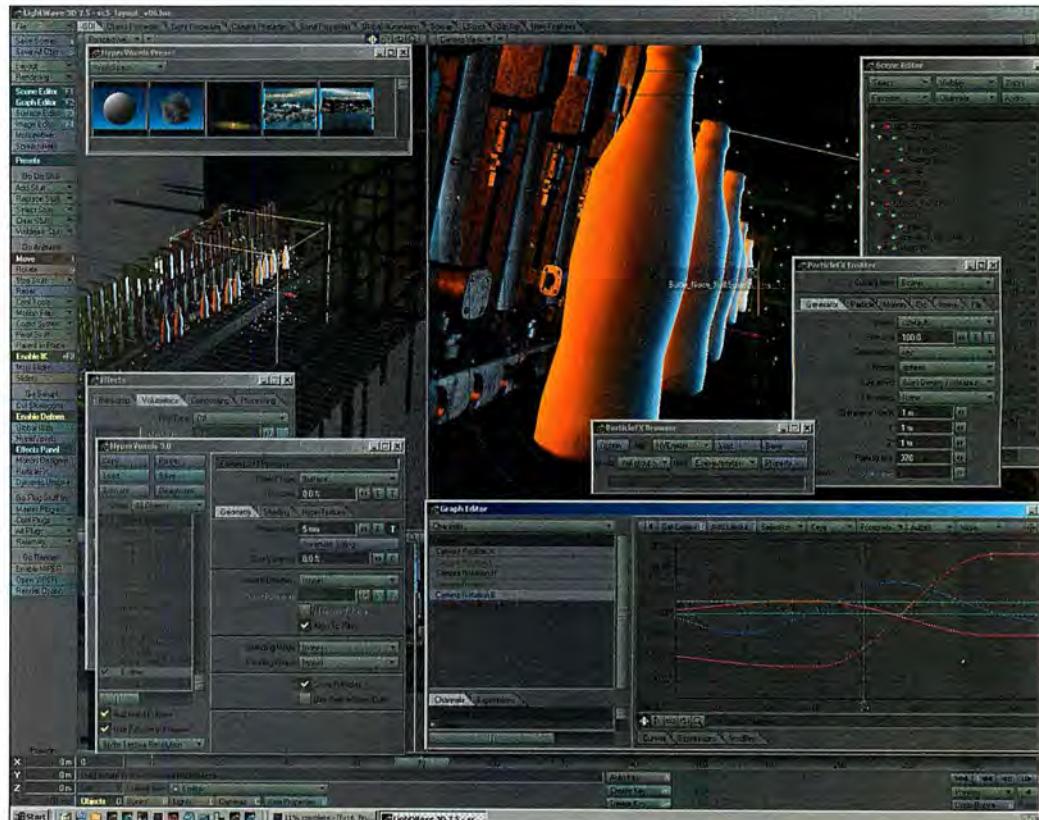
to producing their own customised layouts for the interface, partly because the default layout makes no sense whatsoever and partly because these people are predominantly hoary old LightWavers from back in the Amiga days when there was only one tab with all the buttons on it. One such config is the GO layout developed at Stormfront Digital Pictures to meet this very requirement. Grouping only the tools you ever use on one tab saves a lifetime of rooting around looking for tools by preventing the more obscure ones from cluttering up the screen (the logic is you don't want to muck about, you just want to go). Additionally, the GO config has tabs for Object, Camera, Bone, and Light Properties as well as Global Illumination, which attempts to replicate the layout of these panels so you don't have to open them by pressing [P]. Unfortunately, this doesn't work as well as it could, since *LightWave* doesn't make all the necessary options available to be placed on tabs.

On the Go tab are five main areas. The top area provides access to the various editors, and also has prominent buttons for Save Scene and Save all Objects. Go Do Stuff allows you to add, remove, select, clear, and

visiblize (hide, show and so on) stuff. Go Animate has most of the useful animation tools – move, rotate and so on. Under Go Setup you'll find useful options you'll need when setting up effects or animation, such as the Convert Skeletons button and the Global Illumination panel. Under Go Plug Stuff In is the Master Plug-ins option and the Generic Plug-ins pop-up, as well as a pop-up for Cool Plugs, which you can customise with any useful plugins you have (unless you happen to have the same ones as us, it will probably load blank). Go Render has the two options for VIPER and the Render Options button in exactly the same place it used to be in *LightWave 4* – sigh.

Unlike the Layout version, the default Modeller config is actually pretty good, dividing the tools very logically by their use and putting the selection and v-map tools within easy reach. Unlike Layout, Modeller has always had a series of tabs and these have evolved with the software over the years, with the recent addition of an extra tab for v-map related tools. In practice, hardened modellers are so used to clicking through the respective tabs that they may find it almost impossible to use the Go tab, even though it's quicker. To this end the other tabs have been renamed Don't Modify, Don't Multiply and so on, with the tools renamed GO lathe, GO move and so on, so there's a constant visual reminder that there's a better way.

BY: BENJAMIN SMITH — WEB: WWW.SFDP.CO.UK
Benjamin Smith is the award-winning animation director of Stormfront Digital Pictures, yet he still finds time to help his fellow *3D World* readers

STEP BY STEP: EDIT THE INTERFACE

Increase your productivity in LightWave by customising the interface to suit your methods of working

1 To start editing the *LightWave* interface simply choose Layout > Interface > Edit Menu Layout to bring up the Configure Menus dialog. The menus are accessed on the right-hand side, while down the left you'll find all the commands available to be added to them.

2 To add a new button simply drag an entry from the left pane into the right, noting the yellow line that shows whether the new entry will be a button or hidden in a pop-up. You can rename the buttons to make them more logical (or more stupid, if you prefer).
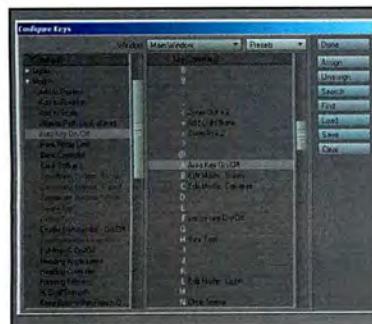
3 You can also choose Layout > Interface > Edit Keyboard Shortcuts to assign functions to the keyboard. Select the command you want in the left pane and the key stroke you'd like in the right side and hit Assign.

4 You can load and save your settings via the Load and Save buttons in the interface. If you want to load the Go config described in the text, choose the go.cfg file from this month's cover CD. In the modeller, load the gomodel.cfg file.

5 You can also edit the menu layout in the Graph Editor, and the Go config uses this to put the Get Layout, Add Layout, and Filter Static buttons on the main bar so that they are easier to reach.

6 You can always return to the default configuration settings by choosing Default from the pop-up in the top right, or by choosing the 6.0 or 5.6 style layout, for all the old-timers out there.

LIGHTWAVE TIPS

LightWave abounds with shortcuts and hidden buttons and options you may not have come across yet

01 If you've just come over from *3ds max*, you might like to explore the Left/Right buttons on the options panel, which can put the main toolbar down the right-hand side, giving you a warm fuzzy feeling of familiarity. Hardball users can alternatively hit the Hide Toolbar option to dispense with the toolbar totally and rely solely on the keyboard. Press [Alt] + [F4] to bring it back when you get totally lost.

02 Don't forget the pop-up mouse menus that appear when you hold down [Ctrl] + [Shift] and press either of the three mouse buttons over a viewport. Although they aren't half as clever as the marking menus in *max* and *Maya*, they are a useful way of keeping very popular tools close at hand, and are fully customisable.

03 Because of the way the *LightWave* interface is implemented, some tools can't be added to the menu tab or pop-ups. However, there are some hidden tools that aren't given a button by default and can be usefully added to the menus. Specialised options such as the feature to antialias the depth buffer and the Shadow Exclude option can be found by searching in the configure menus window.

04 Flay.com features links to several professional configuration setups, including ones by Digital Domain and EdenFX artists. Check them out.

For quick fixes for *LightWave* problems, post your questions in our online forum: **www.3dworldmag.com/lightwave**

Maya

by GEORGE CAIRNS

RIGHT **Dynamically simulated friction and gravity endow the hovercraft with a sense of mass and momentum as a magnetic field pulls it across the terrain**

QUESTION

"How do I animate a vehicle to give it the appearance of having mass and momentum as it crosses an irregular terrain?"

MIKE AHEARNE | via email

ANSWER

To answer this question I created a hovercraft and a simple NURBS terrain. At first, a hovercraft seemed an easy vehicle to animate. Like other CG vehicles you could simply tell it to follow a path and watch it traverse the uneven terrain. However, if you used this simple technique, the vehicle's movement would be too smooth and its speed too constant. It would appear to float along as if it possessed no mass whatsoever, whether it was going uphill or down. The secret to giving a vehicle a more realistic movement is to use *Maya's* Dynamic Tools.

Maya enables you to make objects react to each other as if they are solid and are affected by mass and friction. However, you have to make it patently obvious to *Maya* which components are active and which objects are passive. You can apply ordinary and easy-to-effect forces such as wind or gravity to the active hovercraft, but if you don't make the NURBS plane a passive rigid body, the vehicle will fall through the floor and disappear into the void

of cyberspace (see step 1). Reducing the vehicle's Gravity Field and lowering the friction attributes of the vehicle and the ground plane means that less force will be needed to move the craft.

BEHIND THE SCENES

To give the vehicle an irregular terrain to traverse, click the NURBS plane. Use the Sculpt Surfaces tool and a pressure-sensitive stylus to spray some gentle hills onto the plane's geometry. To make the vehicle move, we're going to create a magnet that will drag it along the ground (see step 3). This magnet, not the vehicle itself, will be attached to a path. While the magnet moves at a constant speed, the hovercraft slides along and bounces about in a realistic manner as gravity and friction alter its momentum when it climbs or collides with the undulating hills. The hovercraft is free to slide around and will inevitably vary in distance from the magnet, giving it a less precise and more realistic movement.

Dynamics is often described as 'animation for free.' I wish! It takes a lot of fine tuning and re-running the simulation to get the desired results. The vehicle will initially bounce around unrealistically as it encounters uneven features in the terrain. It might spin round and even turn turtle as it flips over. You'll need to adjust the vehicle's Mass, Bounciness, and Dynamic Friction values to counter these effects. Once you've fine tuned these values, you'll have created a unique animation that would be difficult to achieve through keyframing alone.

CONVERT TO KEYFRAMES

The Dynamic fields of friction and gravity combined with the undulating terrain give a natural and realistic look to the animation. The vehicle looks like it has mass because *Maya* is simulating that property. Every time you want to see the simulation, you'll have to play the sequence from frame one for *Maya* to accurately calculate the dynamic behaviour of the objects in the scene. This is annoying, as you may want to examine the vehicle's motion at a particular point in the sequence. You can cache the effect of the dynamic fields or even convert the dynamics into keyframes. This means you'll no longer have to rewind and play the sequence from frame one to see the vehicle's movement (see step 6). You can then fine tune the position of the craft at certain points in the sequence by editing these keyframes. To see the finished sequence check out the film on the cover CD.

BY: GEORGE CAIRNS   WEB: WWW.GEORGECAIRNS.COM

George Cairns has been helping *3D World* readers with *Maya* problems since its launch, and helping daytime students for much longer

STEP BY STEP: FAKING IT

Why create the properties of mass and momentum with keyframes when you can simulate them more effectively with Dynamics?


1 Select the hovercraft group using the Outliner. In the Dynamics menu, press [F4] and choose Soft/rigid bodies > Create Active Rigid Body. (Notice that in the Outliner the hovercraft group now has a falling skittle icon beside it, indicating that it has Dynamics applied to it.) Select the NURBS plane, go to Soft/rigid bodies > Create Passive Rigid Body. Now the vehicle will react to the ground when dynamic forces are applied.

2 Select the hovercraft group and choose Fields > Gravity. Raise the hovercraft group a few units above the terrain. Tilt the floor and play the simulation. It bounces around a bit, but doesn't slide down the tilted plane. This is because friction is stopping it sliding. Go to the channel box and reduce the friction of the hovercraft group's Static Friction Node to 0. Do the same for the Static Friction node of the plane.

3 To get the craft moving, select the hovercraft group and choose Fields > Newton > Options. A Newton Field node is added to the scene. Press [T] to show the Field's Manipulator tool. Set Attenuation to 0 and increase the Magnitude. Set Max Distance to 0. Place the Newton Field near the craft and play the simulation. The Field acts like a magnet and pulls the vehicle towards it.
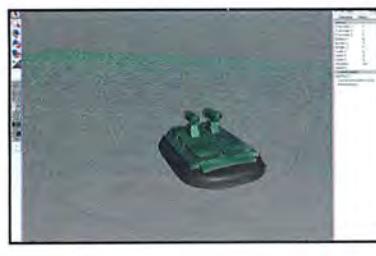
4 Click the Make Live icon – the small magnet in the Status bar – and choose Create > CV Curve Tool. Draw a path along the plane for the hovercraft to follow. Using the Outliner, select the Newton Field node then [Shift] select the path. In the Animation menu [F2], choose Animate > Motion Paths > Attach to Motion Path. Play the simulation and the hovercraft follows the Newton Field as it travels along the path.

5 Once you've applied a force to the craft, use the Channel Box to change the craft's rigidBody1 node's centre of mass so that it rests below the heaviest part of the vehicle – under the propulsion engines. It will now pivot around this point as if it has a real centre of gravity. A small cross icon moves to indicate the new X, Y, and Z positions of the rigidBody node's centre of mass.

6 To turn the Dynamic simulation into editable keyframes, go to the Dynamics Menu Set [F4] and choose Edit > Keys > Bake Simulation > Options. Select Below so that the rigidBody node within the Group's hierarchy is chosen and click Apply. You can then scrub back and forth to any part of the sequence by dragging the timeline. Finally, keyframe the engines to rotate as the craft changes direction so that they appear to be driving the vehicle.

MAYA TIPS

There's more to moving a hovercraft than adjusting its path and orientation. How about a few particles?

01 There are several ways of selecting the group at the top of a hierarchy. One option is to select the group using the Outliner. Alternatively, click any object within the group – the skirt of the hovercraft for example – and press the up arrow. As you press the arrow you'll climb the hierarchy until you've selected the whole group at the top.

02 When drawing a path for the vehicle to follow, make sure you set a long enough range in the timeline to allow your vehicle to realistically cover the desired distance. This is because the Newton Field node will take the length of the timeline to follow the path (even if you change the timeline later).

03 The hovercraft was made by extruding faces from a simple polygon cube and pushing/scaling them into position. When repeating a command often – such as Extrude – press [Y]. This invokes the last command used, saving you the hassle of having to go back to select the command from the menu each time you need it.

04 For a little icing on the cake simulate grains of sand being kicked up as the craft passes along the terrain. Link a primitive shape to the base of the vehicle and make it become a particle emitter. Edit the particles' attributes so that they inherit the movement of the machine. This will make them fly off in the direction the vehicle is moving, enhancing its sense of momentum. Make sure they collide with the vehicle so that they don't pass through it. You can see the beginnings of such a system in the hovercraft film on the CD.

For quick fixes for *Maya* problems, post your questions in our online forum: **www.3dworldmag.com/maya**

RIGHT **Making a bare light bulb might seem easy, but to make it believable in your scene, you need to understand some important base concepts of 3D**

Cinema 4D

by ADAM WATKINS

QUESTION

I really want to nail the lighting for a scene with a bare bulb, but I can't seem to get a believable scene. Have you any suggestions?

CATHERINE GLASS | via email

ANSWER

Creating a naked light bulb in a room should be a simple matter, but there are several funny things about the way rendering and light works that often make the process frustrating. However, if you understand these eccentricities, the process can be controlled.

The first thing to understand is that you usually can't see a virtual lighting instrument. That is, when you place a light within your scene, you can see the effects of the light, but not any object that seems to be emitting that light. Of course, you can make volumetric or visible light that helps let you know more directly where a light source is; but this volumetric light never really looks like a light bulb or something like that. So before you can begin to get going with a naked light bulb, you need to start the lighting process by modelling the geometry for the bulb.

Once the geometry is there, you can create the virtual light (an Omni light) and place it within the actual geometry. Ultimately, this virtual light will emit the light, but the geometry will make the scene's light source logical.

The second important thing about naked light bulbs is that they do not really glow. The tendency most folks have when applying textures to light-bulb geometry is to stick a texture with the glow pumped way up. Although this can sometimes create a nice, soft effect, it presents all sorts of problems if you have a mirror in the room, or a highly reflective marble floor. Because glow is a post-rendered effect (applications paint the effect onto an object after it's rendered), the glow will not show up in any reflections.

THERE IS A LIGHT THAT NEVER GOES OUT

A better way to think of the surface of a light bulb is to remember that it's luminant – it has its own inner light. Remember the Luminance channel for a Material. Remember also that you can give a surface its own inner light. The problem with this for most objects, is that luminance has a tendency to obliterate much of the shape of an object. But when a light bulb is on, you really are unable to see much more of the form of a light bulb than the outline anyway. Further, when the light is on, all the other channels of the Material really don't matter – the luminance channel will obliterate all of them.

The last important thing to understand is the nature of light rays within a raytracer. Raytracing engines essentially treat light as a ray that can be stopped as it encounters an object. This is a fairly effective, but over-simplified simulation of light in nature. This means shadows are created as light hits a surface and stops. The problem with this is that there are some surfaces that light should be able to pass through easily, such as glass. Now, most raytracers do indeed allow light to pass through objects that have a material with Transparency activated. Most will even calculate how the light changes colour through different coloured material. However, generally, when setting up a light scene with bare bulbs (including virtual light sources inside of light objects (light bulb geometry), spending time on changing Transparency and making sure that the light works alright is more hassle than it's worth, especially if the light is casting shadows. An easier solution is to create a tag that tells *C4D* to make a surface that doesn't stop any light rays as they pass through it. In release 7, this was called a Render Tag, in release 8 it's called a Compositing Tag.

Once you've created and textured the geometry, you've given the virtual light the appropriate fall off, and you've set up the light bulb so that it doesn't stop the light emitting from the virtual light, you're ready to flip the switch.

BY: ADAM WATKINS   WEB: WWW.UIW.EDU
Adam Watkins lives in Texas, where he is the Director of Computer Graphics Arts at the University of the Incarnate Word

#073

STEP BY STEP: LIGHT WORK

Sometimes, the simplest things can be the most complicated
to model, especially if realism is important to your scene
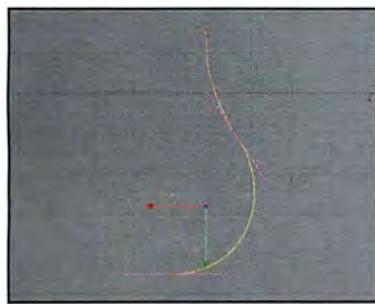
1 Begin by creating the geometry that will make up the light bulb. In this case, the light bulb was creating using a Lathe NURBS object and a spline similar to that shown above. Apart from the base the bulb screws into, there's no need to model anything more sophisticated.
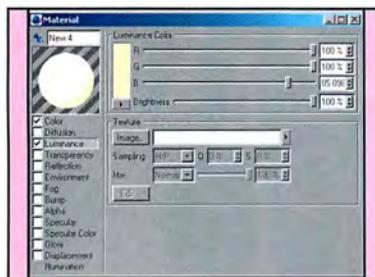

2 Create a material with no glow, but with high Luminance. (You don't actually need the Color channel activated.) Depending on what sort of light bulb you've planned for your scene, you may choose to make this luminance colour something besides pure white. Usually, a bit of a yellow tint helps make things look a little less stale.

3 Once the geometry is done, actually create the light source. Placement is rather important. Unlike a real light source, there's an infinitely small point from which all light emerges. Too close to the base results in unbelievable light around the base of the light. Too far down, or out of the light geometry, produces unbelievable angles. Place virtual light towards the edge of the light bulb.
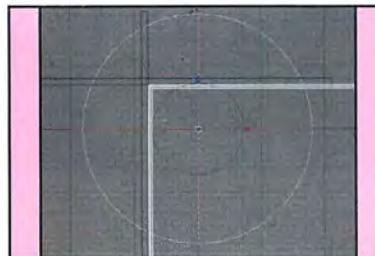
4 Make sure you control how far this light throws and how its shadows fall. If there's only one light in the room, activate Hard shadows. Make sure you activate Falloff and set the inner and outer distances so that you have slightly darker, but not black corners. This shot shows a top view with the inner distance just licking the walls of the room.

5 If you're using R7, right click and hold the object that is the geometry of the light bulb, then select New Tag > Render Tag. In R8, right click and hold, then select New Tag > Compositing Tag. Once the tag is created, double click it in the Object Manager and turn off Cast Shadows. The light from the virtual light will pass unimpeded through the geometry of the bulb.

6 Here's where things get tricky. Even with the light at the end of the bulb, with just raytracing, you still end up with a very dark base. If you use radiosity, the bounced light of the ceiling will take care of it. If not, take some time to create some other light sources so you don't end up with an image like this.

CINEMA 4D TIPS

You need good logic skills and imagination as well as an artist's eye to make realistic light sources

01 When working on lighting a scene, you must find a careful balance between what the software should know how to do, and what you know about the way lighting really works. The tutorial on the left shows that the software is just not smart enough to accurately mimic what happens in real life. Don't just trust the raytracer or even the radiosity rendering of any application. Look, think, and re-render.

02 Keep in mind, especially with raytracing, that light bounces. It bounces off of very reflective surfaces like mirrors, but it also reflects off of other surfaces such as tables, walls, ceilings, and floors – any hard surface, in fact. Often, the key to emulating this effect is to remember that even though there might be just one light source in the room, you can always create other light sources to simulate the light that is bouncing around. Usually, the best way to do this is with an Area light.

03 Notice in the real world that the hardness of shadows usually depends on how many light sources there are in the scene. For instance, when outside on a sunny day, your shadow is very hard because there is one intense light source. However, when you're inside and there's a grid of fluorescent lights above, your shadow is extremely soft, as each set of lights fills in the shadows of the other lights. This is an important detail when trying to decide whether to select hard or soft shadows for any light placed in a scene.

For quick fixes for *Cinema 4D* problems, post your questions in our online forum:
www.3dworldmag.com/c4d

RIGHT **The opening credits from the *Play Your Cards Right* television programme, made with particles**

XSI

by PHIL DOBREE

QUESTION
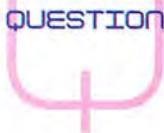
"How can I create multiple particles with a single cloud in XSI, and then attach objects to these particles?"

MARGARET FORD | via email

ANSWER

The reason *XSI* has trouble rendering multiple clouds is that *XSI* particles uses a volume shader to render, which will create unsightly artifacts if overlapped. There is, however, a way to have multiple particle systems or emissions attached to a single cloud. There is a drawback of using only one cloud: when you make any changes to the cloud or its shader it will affect both or all the emissions in that cloud. For example, when you attach objects to the particles it attaches the objects to all the particles in the cloud, not onto each emitter. To have a variety of objects on different emitters, you could create multiple clouds, in which case you won't get the problem with rendering artefacts as you'd be *rendering objects, not particles*.

PARTICLE PROPERTIES

The basic principle of creating multiple particle emitters on one cloud is to get more than one emission object, then by selecting just one, create a particle emission from that object. This will give you a particle cloud icon from which you can set emissions for as many other objects as you wish. Having got multiple emitters with only one cloud, you'll need to create as many particle types as you wish to have. Each particle type in the emitter property page has its own properties, which you can amend as you require. This works in much the same way as *Softimage Particle* used to work. If you change the shader of the cloud rather than each particle type you will then affect all the particles in that cloud.

PARTICLE FLOCK

There are two ways of having objects as particles. The first way uses a script to actually attach objects to the particles; the second uses pre-rendered sprites of objects. The second method is obviously a cheat, but will produce quicker results and playback times, as well as a closer simulation of the actual particles. By attaching objects to particles, the number of objects you attach will need to be high to keep up with the rate the particles are being produced. This will also result in the objects collecting in the centre of the scene. To prevent this appearing at rendering time, a workaround is to move your emitters and camera away from the centre.

The objects you've attached to particles will respond to forces and obstacles along with the particles. A very useful application for this would be if you wanted to create a flock of bees, birds, or any other flying objects. By animating the objects in cycles and offsetting them, you can then attach them to the particles and ensure that the tangency is on to give them a direction. Your one or two flying objects then become a flock of flying objects, which can be influenced as you would any particle system.

SPRITE CONTROL

To use sprite objects or animations as particles, you simply select Sprite in the Particle Type > Shader Shape part of the emission PPG and select the pre-rendered sequence you made earlier (normally, this will be a full animation cycle of an object). By editing the sprite, you can then control the number of times the sequence can repeat and whether you want it to bounce, hold, or cycle. You can then affect the tangency and randomness of the sprite on the particles so you don't get a uniform effect. The tangency settings can be found at the top of the shader shape section of the PPG and the animation control just below the first sprite window.

#075

STEP BY STEP: MULTIPLE PARTICLES

Create and attach multiple objects to multiple particles from a single cloud for clean animation in XSI


1 In Simulate mode (press [4] to activate), choose Primitive > Surface > Grid (for the sake of this example) – in fact, particles can be emitted from any type of surface. Next, make a primitive surface disc, although once again, it can be any surface – including another grid if you so wish. Offset the two primitives from one another.

2 Choose Create > Particles and select the grid. Close the Property page that pops up. In the Explorer or 3D view, select the cloud icon and choose Modify > Particle > Set Emission, then pick the other object, in our case the disc. Right click to end the selection. Don't close the PPG – lock it by clicking the lock icon in the upper right corner of the PPG. You should now have two emissions – one for each object – but still only one cloud.

3 In the PPG you just locked, we'll now create another particle type. Those familiar with Softimage particles will recognise this procedure. We need to create a different particle type for each emitter. Select the New next to the Particle_Type box at the top of the PPG. A new particle type will be created called Particle_Type 1.

4 Rename it to something you can relate to, for example, Disc_particleT. Alter the settings such as the rate spread and the colour in the Rendering Properties. When you play it back, you should now have two particles that can cross. If both are emitting the new colour, go to the emission PPG of the grid and make sure the particle type is set to the original (that is, not Disc_particleT).
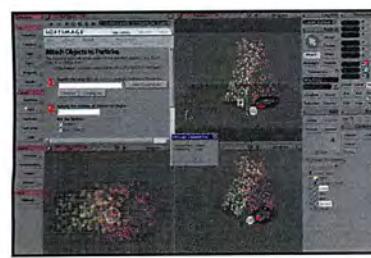
5 To do this, you need to use a script from the library of tools in Netview. Go to Netview and choose Tools > Simulate. You'll notice two objects attached to particle scripts, one demo and one scripted page and op. Pick the icon next to the scripted page one. You'll get a user-friendly interface in the window (you'll need to have created the objects that you wish to attach to the particles.)

6 Enter the names of the objects you wish to attach in the first box. You can enter as many as you wish by clicking Add Object to List. By clicking Display list, you'll see which objects have been selected. Next, specify the number of objects you wish to attach. If this number is below your particle rate, you'll get an excess of particles to objects. The particles will not render and you'll get a few objects rendered at the start of the simulation. Finally, create the objects from the particles.

XSI TIPS

Particles out of control? Try our troubleshooting tips to help rein them back under your control

01 One thing to be aware of is if you create obstacles or forces for the cloud they will be applied to all the particle types unless you access the Environment tab of the particle types you don't want affected and set the values to 0.

02 Another potential hazard is if you decide to change the shader's properties rather than the particle types. The shader will overwrite the Particle_Type. If you want to use specific properties, which you only get through using the shader (such as self shadows) you may have to resort to rendering separate passes for the different particle types, and turning the properties on and off for each one.

03 If you need to have several different object types attached to particles, you'll need one cloud for each object. If you attach objects to particles, it applies them to all the emissions in the cloud. You don't get the rendering artifacts in this case as you render objects, not particles.

04 Make sure you specify enough objects to attach to the particles. If the number is less than the rate, you'll have a number of unattached particles. You may be able to live with this, but the system may peter out a bit early for your liking. You may have to experiment with this option.

For quick fixes for 3D problems, post your questions in our online forum: **http://forum.3dworldmag.com**

REVIEWS

Cinema 4D R8

Release 8 moves Maxon's flagship onto an entirely new plane of competition

BY ADAM WATKINS

SUPPLIER MAXON COMPUTER   **CONTACT** 0500 223 660 (US 877-226-4628)   **WEB** WWW.MAXON.NET   **FORMAT** MAC/PC

See below for prices

PRICE STRUCTURE
>> C4D R8   £390 ($595)
>> C4D XL R8 (includes Advanced Render, MOCCA, Thinking Particles, Net Render and PyroCluster modules) £1,105 ($1,695)
>> C4D Studio R8 (includes all modules) £1,658 ($2,495)
>> Upgrades available at www.maxonshop.com

MINIMUM SYSTEM
>> Windows 98/Me, 400MHz Celeron/ Duron/compatibles, 128MB RAM
>> Mac OS 9.x, PowerPC, 128MB RAM

MAIN FEATURES
>> New accelerated OpenGL implementation
>> Optimised interface organisation
>> Weighted HyperNURBS
>> New MOCCA character animation tools
>> New Timeline and F-Curves editor
>> Faster rendering; new depth of field tools
>> XPresso (node-based expressions editor)
>> Thinking Particles (powerful particle generation module)

[01] **MOCCA provides character animation tools that when used with the new F-Curve editor make C4D a true CA tool**

[02] **Dynamic, organic scenes can be created through C4D R8's increased lighting and texture control**

[03] **Cappucino provides for real-time recording of motion. Notice also the expanded Timeline here**

01

Peter Bookwood, 2002

02

Janine Pauke, 2002

03

Although it has been making great strides in the halls of public opinion recently, Cinema4D XL is arguably the most underrated software in the 3D market today. Well, hang on to your hats, because R8 is out to change everything you thought about C4D.

INTERFACE IMPROVEMENTS

There are some important changes in the interface that greatly speed the workflow. The first is a greatly enhanced OpenGL optimisation. Large numbers of polygons are easily displayed, rotated and manipulated. New Dual Planes is a smart option that tells C4D to only worry about refreshing polygons that are in motion, meaning that your video card needn't redraw every polygon every time. You'll be amazed by the difference this makes.

Also improved are details like the Attributes Manager sitting beneath the Objects Manager. No more double-clicking a tag, making changes and hitting the OK button. It's all visible at all times. You can also choose multiple tabs to be visible for quick and easy access.

Another interesting feature is the Smart Pointer that enables you to filter your selection as you are working in the editor. But perhaps the biggest joy of the new interface workflow is Multiple Selections (praise the gods of 3D!).

Maxon's workflow was good to begin with, but the programmers have obviously been listening to the needs and wants of the users. If you had issues with the interface before, you will find that most (if not all) of those concerns have been resolved in R8.

MODELLING

The changes here are fewer, but no less significant. HyperNURBS was a huge step forward when it first appeared a couple of versions ago. R8 introduces weighted vertices – called HyperNURBS Weights. This means that rather than having to create multiple planes close together to create a hard edge,

you simply grab the points of the HyperNURBS cage and increase/decrease the strength, thus softening or hardening the corner. This is really a great idea and a fine implementation that adds increased usability and power to the HyperNURBS concept.

Also of import is the addition of Edge Extrude and Edge Bevel tools. If you like to model things by the more detailed poly-by-poly method, you'll love these tools. No more creating rings of points to bridge together – just extrude edges out to create new rings of polygons.

ANIMATION

Animation is where R8 really shines. The well-organised, but limited Timeline of versions past is greatly enhanced, enabling you to only have to wade through animated objects. You can create separate tracks for the X, Y, and Z Movement, Scale, or Rotation. And everything imaginable is available for animation.

The old Space and Time Curves windows have been replaced by an F-Curve editor. More efficient and far more powerful, this new F-Curve editor enables quick and painless ramp-ups and -downs for motions, and allows you to quickly control the interpolation between keyframes (including among multiple objects) quickly and efficiently. This new F-Curve window by itself makes the package worth the upgrade price.

CHARACTER ANIMATION

That's right – you read it correctly, C4D, with its new implantation of MOCCA has become a legit character animation package. Among the tools included in MOCCA, the rigging process (including IK chain set-ups) is an amazingly quick and accurate process. With added invaluable tools like UpVectors, you can truly eliminate pesky problems like gimbal lock and unintended bone rotations. You can quickly set up a rig that works great for most characters.

One of the past omissions of C4D's CA tools was the ability to use sliders to morph between preset poses or facial expressions. In R8, Pynthesizer fits the bill. All of a sudden, C4D can be used for complex facial animation or hand motions via sliders that enable you to create faces or poses that are somewhere between phonemes or poses you have

Samir Kharchi, 2002

Janine Pauke, 2002

previously constructed. This really is a must for CA, and it's now available.

Perhaps the most interesting thing that Maxon brings to the table with *R8* is the use of SoftIK. Basically, this is the ability to tell *C4D* to automatically create secondary animation for IK chains. You can now control how floppy joints are and how much weight they appear to have. The result is the automation of motion that would normally require incredible amounts of further keyframing. Interesting concept – it will be interesting to see if this turns out to be a valuable tool, or a dismissed shortcut. Either way, for character animators, it makes for quick creation of complex movement.

Finally, an intriguing tool called Capuccino enables you to record motion in real time. Then you can optimise the number of keyframes for future editing – a novel idea. Again, it will be interesting to observe its ultimate usefulness in character animators' workflows.

LIGHTING AND RENDERING

C4D always had a speedy renderer. The renderer in *R8* is even better. Maxon claims rendering times up to 40% faster. Although we didn't notice things rendering that much faster, there was a perceptible improvement.

More important than the speed is the increased power. The new depth of field tools are truly powerful, giving you complete control over all aspects of your camera's focus including the degree to which things are blurred – this is really a brilliant addition.

Adding to the great ideas implemented is the ability to create Light Inclusion/Exclusion lists. You can easily control lights in ways not possible in the real world and create the lighting you want right from the beginning without as much painstaking tweaking.

Carles Piles, 2002

Paul Everett, 2002

MISCELLANEOUS

There are many other important additions to *release 8* that there just isn't room to discuss here, but here are just a couple of the best. Thinking Particles (an incredibly powerful new particle system) enables you to create any particle system imaginable – far beyond just a consumer-level implementation. XPresso enables you to truly take advantage of the previously powerful, but unintuitive, COFFEE scripting language. The node editor allows for non-programmers to visually build complex expressions that can be used throughout *C4D* (most effectively with Thinking Particles).

The new pricing scheme can be confusing but more effective for most users. With the new Modules approach, you can leave out parts of the package that you don't want to pay for. Or, you can purchase Bundles that save funds over all. Deciding which package is right for you take a bit more research now, so be aware and do your homework.

OUR VERDICT

This is the most powerful and important update since version 6. This version will make *C4D* converts out of many, and the new tools and paradigms introduced here will undoubtedly be copied by competitors. This is a tool to be reckoned with. It's fun to work with, easy to create with, and a tour de force for Maxon and its customers. ■

3D VERDICT	10
RANGE OF FEATURES	10
VALUE FOR MONEY	9

PROS Fast interface – really fast>> Real, working, Character Animation Tools >> New power in rendering/lighting controls

CONS Most powerful tools (MOCCA and the other modules) are purchased separately, or as part of a more expensive bundle >> Wasn't out sooner!

MojoWorld 2.0

The strangest program on the face of the planet is back, and it's better than ever   **BY ED RICKETTS**

$249 ($199 for limited time)

MINIMUM SYSTEM

>> PC: 400MHz, 90MB RAM, 100MB HD, Windows 98/Me/NT4/2000/XP, 16MB graphics card

>> Mac: 350MHz PowerPC, 96MB RAM, 100MB HD, Mac OS 9/X, 16MB graphics card

MAIN FEATURES

>> Creates entire fractal planets

>> Pixel-level detail rendering at any res

>> Three UI levels including function graph view

>> Atmospheres and water with raytraced reflection and refraction

>> Sun and multiple moons with 3D relief and rings

>> Renders still images, animations, and QTVR

>> Standard 3D primitives and lights

>> Imports standard 3D file formats

>> 3D previews of textures and materials

>> Improved rivers

[01] **Thanks to the weird nature of fractals, some truly alien landscapes are possible in *MojoWorld*. The new raytracing is especially welcome**

[02] **You can also create naturalistic, earth-like terrain – and zoom into it as closely as you like without losing detail**

[03] ***MojoWorld's* real-time renderer shows a rough approximation of your world without the fine detail**

[04] **At the core of *MojoWorld* is the Texture Editor, used for landscape shape, and the Material Editor, used for surface properties. Things can get very complex in here**

One year has passed since the original *MojoWorld* was released, and in that time it has quietly but steadily amassed a loyal army of artists and fans. But it's still not a 'household' name, and that's partly because, as amazing as it is, the *MojoWorld* concept is not easy to grasp.

Simply put, it creates fractal worlds. Not just small landscapes à la *Bryce*, but entire planets, complete with oceans, rivers, stars, and moons. Even more amazing, these can be viewed from miles out in space right up to the smallest rock with absolutely no loss of detail, because *MojoWorld* is entirely procedural.

Generator, the commercial planet-creating part of the suite (there's also the free Transporter, which can be used to explore and render worlds), is based entirely on fractals. A basis function determines the basic shape of the terrain, and this drives a fractal algorithm – from simple 2D noise to complex multifractals. You can then combine these fractals using various modes or blend them using an entirely separate fractal function tree. Materials work in the same way, and can be distributed according to slope, altitude, or any other function you care to create.

Sounds complex? It is, at least until you get your hands dirty. Imagine *Bryce's* Deep Texture Editor multiplied by a million and you're roughly there. Not surprisingly really, since *MojoWorld's* creator also wrote that part of *Bryce*.

Version 2 is essentially the same, but many of the rough edges from the first release have been smoothed out. Most importantly from a visual standpoint, the rendering engine now supports true raytraced reflection and refraction, and it makes a hell of a difference to scenes with water. Fortunately, raytracing

> **"MOJOWORLD ISN'T JUST BETTER THAN BRYCE – IT'S A GENERATION AHEAD"**

doesn't seem to have slowed down the renderer all that much, either.

BREATHTAKING WORLDS

You can now see a real-time 3D preview of textures (used for landscape shaping), there are materials in the editors (using the real planet terrain), and thumbnail libraries with descriptions have been added for most components. The new Planet Wizard enables you to quickly throw together a world by choosing from library presets, which is a great way to explore possibilities and start tweaking. There's also a wealth of preset content supplied, including some breathtaking worlds created in the last year.

Atmospheres can now have two levels: clouds and low-lying mist, though clouds themselves remain as flat 2D planes rather than volumetric objects. Planets can have rings, and the river plugin, now an integral part of the package, has been improved, too.
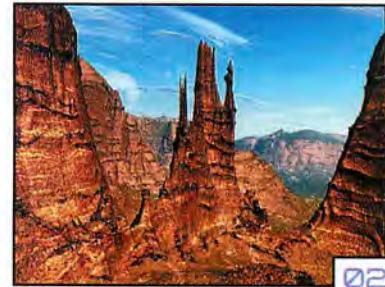
Usefully, the Node Janitor can automatically remove any components not used in your world – a task that was rather tedious to do by hand. The file size of planets has been drastically reduced, too – up to 95% in some cases – making it much easier to distribute your creations. Finally, you can render using tiles, hopefully eliminating the problem of running out of memory with large images.

MojoWorld isn't just better than *Bryce* – it's a generation ahead. It's not an easy program to learn, and it's essentially infinite scope can be overwhelming, but once you click with the basic ideas you'll be well and truly hooked. ■

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3D VERDICT

VERDICT	**9**
RANGE OF FEATURES	8
VALUE FOR MONEY	10

PROS The only program of its type >> Imports standard 3D models >> Essentially infinite number of worlds >> Powerful node graph system

CONS Slow rendering >> Difficult to learn

AXELedge 2.0

A range of import and export capabilities mark MindAvenue's latest update

BY ROBERT CARNEY

Since it was released a couple of years ago, *AXEL* has slowly become one of the big players in the world of Web 3D. And up until recently, this world hasn't exactly been an overpopulated one. Sure, *Swift 3D* has been around for a while, and offers a decent solution to 3D *Flash* work, and Discreet's recent *plasma* has *Flash* and *Shockwave 3D* animated content sewn up. But the problem with *Flash* and *Shockwave* is that it's impossible to produce interactive Web content directly from them – you'll need a good understanding of either *Flash's* ActionScript or *Director's* programming language, Lingo, to add actions and reactions to your Web 3D.
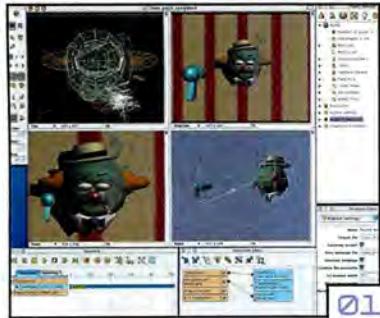
AXEL, though, is a little different. Since its early days, its developer, MindAvenue, has been touting the product as an all-in-one Web 3D solution – an application that provides modelling, character set-up, animation, material editing and interactivity tools within a single, simple interface. Basically, MindAvenue caters for 3D artists who want to put interactive content on the Web, as well as for Web designers who want to do something new.

FEATURE SET

Regular readers will be aware of *AXEL's* main features, since we placed it on the CD last month, but here's a brief rundown for the part timers: it includes a curve/surface modelling toolset, enabling you to create relatively complex models easily; animation tools include IK, FK, and skinning features, along with a full-on particle system, timeline, and graph editor; and when you're finished, you can render in cartoon, shaded, and wireframe. The best feature by far, however, is the Interaction Editor. This enables you to link reactions to mouse actions simply by linking nodes. This is, and has been from release 1, an incredibly efficient tool.

Up until now, *AXEL* has only enabled you to output files to the *AXELplayer* format. It's also had extremely limited import ability. Version 2,
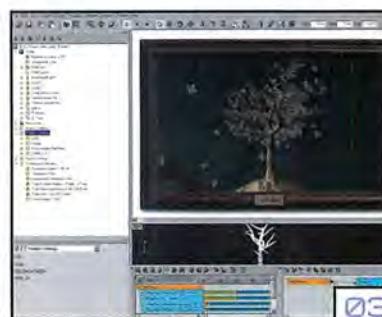
however – now called *AXELedge* – looks to improve on this by a fair margin.

On paper, it doesn't look like there's much new when compared with version 1.5, but MindAvenue has obviously thought very carefully about what the original was missing. You can now import files directly from *3ds max*, *LightWave*, and VRML 2 (and, by extension, *Maya*). This essentially means you can model in your favourite modeller, and get that model into *AXELedge* for adding interactivity, particle effects, and materials.

But that's not all. MindAvenue has added the ability to export standalone executable files, enabling you to publish interactive 3D animations to CD and DVD. You can also publish your *AXELedge* animation to SWF format (about time, too), but unfortunately, you'll lose the interactions. Content will also play in *QuickTime*, eliminating the need for your site visitor to have any other plugin than Apple's ubiquitous offering.

AXELedge 2.0 doesn't bring a huge new addition of tools, but with its wide range of import and export formats, it looks to be even more appealing to those wanting an easy way of getting interactive 3D content on the Web. It's an extremely powerful tool that artists and Web designers alike may just learn to love. ■
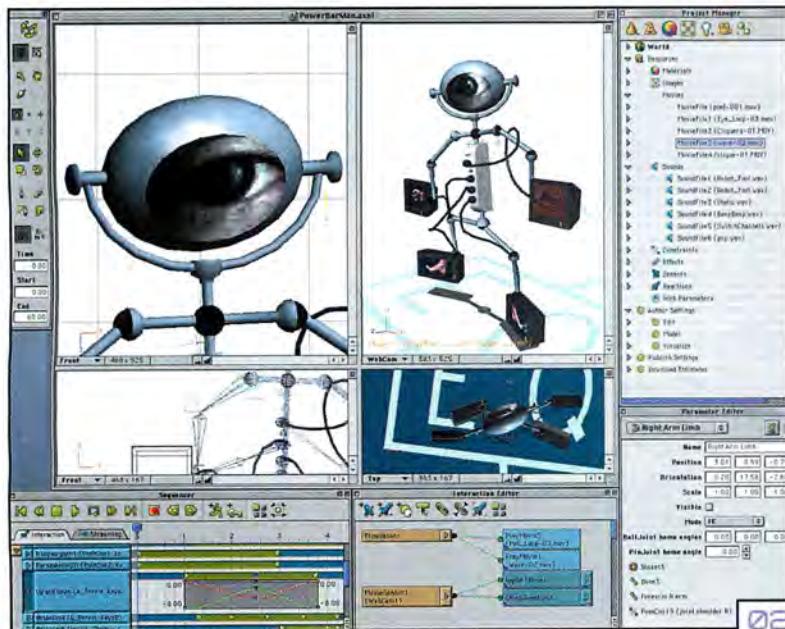
3D VERDICT   **8**

RANGE OF FEATURES	9
VALUE FOR MONEY	7

PROS Great range of import and export tools >> Easy to use, intuitive interface >> Excellent interaction editor >> Easy entry into the world of Web content creation

CONS A relatively sparse upgrade in terms of real new features >> Expensive

[01] *AXELedge's* interface proves easy to navigate and extremely intuitive

[02] The interaction editor enables you to quickly link actions to events

[03] A wide range of import and export formats widens *AXEL's* remit as a professional Web 3D tool

FaceStation 2

Real-time and pre-recorded facial motion captured directly into your 3D package **BY PETE DRAPER**

MINIMUM SYSTEM

>> *3ds max 4.25* (or later) or *Maya 4* (or later)
>> 512MB RAM
>> 200MB HD
>> 700MHz CPU
>> Standard video capture device and camera
>> Good lighting conditions

MAIN FEATURES

>> Accurate use of pre-recorded media
>> Real-time Puppeteering
>> Avatar creator/editor
>> Simple set-up
>> Can be used across a network
>> Tongue and teeth resolving
>> Audio analysis
>> 'Morph to Bone'

[01] Import two photos into the Avatar Editor and by amending the green outlines' positions, the 3D face is sculpted to fit the photos. The feature even runs on automatic

[02] The final head is made up of several versions you create yourself and add as morph targets. *FaceStation 2* takes these targets and mixes them to match your animation

[03] It's easy to get carried away with the real-time system to the early hours of the morning – as the yawn illustrates!

ind facial animation a bit of a chore? You need *FaceStation 2*. Eyematic's flagship package allows artists to generate facial animation directly from reference footage of an actor – without the need for extensive keyframing or an expensive MoCap rig.

Tested here in *3ds max* versions 4 and 5 (it also works with Maya), *FaceStation 2* uses *max's* own Morpher and Motion Capture Utility, with the added extras embedded seamlessly into the utility. Because of this, preparing your head model is as simple as it would normally be. Okay, so a extra little work is required, such as setting motion capture controllers to the relevant morph targets and assigning them to the motion capture utility, but this takes no longer than a few minutes. *FaceStation 2* can also use *3ds max's* bones and skin to pivot and rotate the head, and can resolve eye positions, which are also captured.

Now you have your head all set up, it's time to capture the data. From stock footage, this is a snap, but the motion capture 'Tracker' program can really suck some system resources – so to run the system in real time, you'll need a decent PC. Minimising the Tracker helps alleviate the lag, or you can run the system on another networked machine and connect to it using the feature in the Motion Capture Utility within *max*. The results

are very good, but not as accurate as if you were using pre-recorded footage, as there's no room for precisely editing tracker positions. That said, the tracking system itself is quite accurate, and any irregularities can be smoothed out later within *max*. It's easy to get carried away with the real-time system, and it's amazing how easily it recognises a face and sets tracking markers in a matter of seconds.

LOOKS CONVINCING

But the real power of the system lies in the Lifter software. This enables you to use any pre-recorded footage of an actor's performance – or, by using its own capture utility, to capture and save your own. The exported animation and facial extent data is

01

then imported into *3ds max* with a couple of clicks. Here, any slightly erratic animation is easily refined and smoothed out within Track View. Another feature allows you to import the audio track and a text file of the dialogue of the pre-shot footage. It then analyses the track and automatically refines the animation to accommodate mouth closure (for example). A little more work and you can refine the animation further so phonemes are more clearly visible.

An avatar editor and creator is included, which can create pretty good heads in a very short space of time using side and front photos. The automatic feature is quite impressive, and with a couple of slight alterations can result in a convincing avatar, which can then be imported directly into *3ds max*, complete with morph targets.

The audio and text analysis and the Morph to Bone feature, which enables you to use the data in a bone set-up for a game engine, are very impressive, so request an evaluation copy of the software for yourself, grab a camera, put your feet up, and begin facial animation the way it should be. ■

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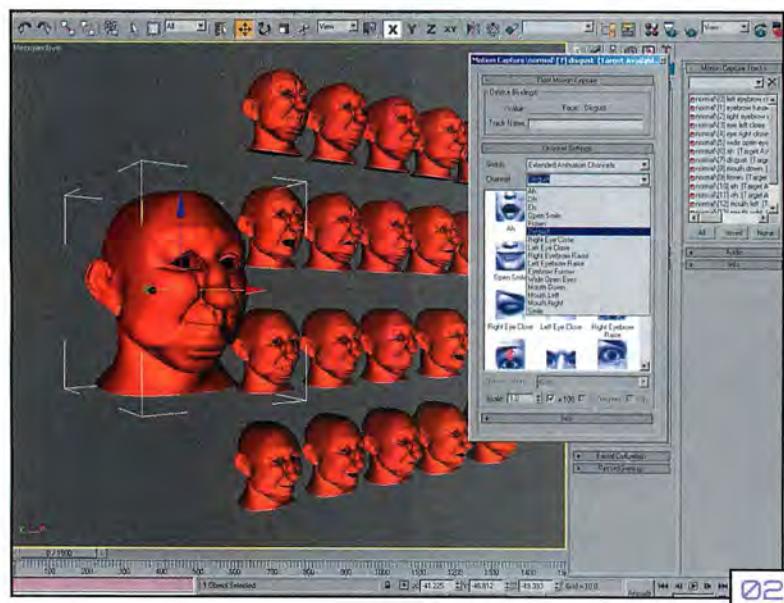
3D VERDICT   **8**

| RANGE OF FEATURES | 9 |
| VALUE FOR MONEY | 8 |

PROS Fast facial tracking >> Quick set-up – uses existing *3ds max* features >> Real-time motion capture over a network >> Audio analysis using existing audio track >> Easy teeth and tongue resolving >> Quick avatar creator

CONS Real-time system is very resource hungry >> Resulting expressions only as good as your morph targets >> Additional programs can be slightly resource hungry >> Tracker profiles won't work in Lifter, although they will load in

RealFlow 2

Fluid simulation is tricky, but NextLimit's RealFlow 2 makes it look easy

BY SIMON DANAHER

| SUPPLIER NEXTLIMIT (BUY ONLINE)	CONTACT +34 915 102 202	WEB WWW.NEXTLIMIT.COM	FORMAT PC ONLY	$1,195 (£752.96)

01

02

F luid simulation seems to be becoming a popular area to focus on lately. *Maya's* latest release incorporates some serious fluid dynamics, and now we have the latest update from NextLimit to their *RealFlow* fluid simulation system. *RealFlow 2* reproduces the effects of sloshing liquids, gasses, and other fluids through the use of particles. These particles are intelligent, as opposed to the 'dumb' kind you find in most 3D software, in that the interaction between each and every particle is also calculated so that effects of coherence, surface tension, and viscosity can more accurately be produced.

The new version improves on *RealFlow 1* in terms of interface design and workflow. It has multiple, resizable viewports, manipulator handles à la *Maya* and so on, and a new roll-out parameter panel that looks like a cross between *Maya's* channel box and *max's* modifier stack.

Although the makers claim *RealFlow* can handle 1,000,000 particles on a standard PC (we didn't try it, by the way) there's a new Resolution feature in version 2 that can help in managing large simulations. By reducing the resolution you can speed up the simulation, but not actually change the resulting behaviour. Therefore, you can have a low resolution for previewing and a high resolution for final output.

BETTER THE DAEMON

There are ten types of emitters on offer, and 24 'daemons'. These are various kinds of forces and modifiers you add to the scene to modify the particle motion. Typical daemons include Gravity, Drag, Layered Vortex, Magic, and Limbo. The great thing about the system is that you can import animated scenes and add particles that react to the imported motion. Objects must be triangulated polygons, and there are plugins for all the major 3D

applications that help export animated scenes for use with *RealFlow*.

The program is undergoing refinement and there were still quite a few rough edges when we looked at it, notably with regard to stability. However, the program is capable of some stunning results, but it does take time to both set things up and calculate the fluid behaviour. At least you know that at the end the result will be just about as good as you can expect with current technology.

The interface is an improvement and the simulation does seem faster than before, particularly the mesh generation. There's also a new timeslider and play controls, but despite NextLimit's assurances, we couldn't seem to replay the simulation after calculating it. Also, it would be nice if the program offered some simple primitives (in the same way that REALVIZ products do) for quick testing of settings rather than relying on external programs and exporting or importing all 3D geometry.

That said, there's really not a lot else in the game as far as fluid simulation is concerned, and *RealFlow* is as good as it gets. Admittedly, it doesn't do volumetrics – it's a dynamics and mesh-generation system, not a renderer – and the overall workflow between it and a surrogate modeller/renderer can be a bit of a chore, especially if you have to keep adjusting the animated objects. However, it does do the job, and in most cases it does it very well, but you'll need a powerful PC to get the best from it. ∎

[01] **The new fluid engine is faster than in the previous version. Inter-object and particle-object collisions are also supported**

[02] **The surfaces of fluid simulations can be meshed automatically. Here two streams pour into a vessel and merge into one surface**

[03] **The Colour Plane daemon doesn't actually modify the scene, but can be used to visualise what's going on. Here it's displaying the particle density as a gradient**

[04] **There are many daemons available. Here a simple spawning system is created using an Age daemon, where the particles split after a certain age**

03

04

3D VERDICT   7

RANGE OF FEATURES	8
VALUE FOR MONEY	7

PROS **Excellent >> Efficient fluid simulation >> Inter-particle forces >> Object collision**

CONS **No built-in primitives >> Still a little buggy >> Workflow between other apps can be a chore**

G2

A photorealistic surface shader for LightWave, and much more besides

BY BENJAMIN SMITH

£320 ($499)

SUPPLIER WORLEY LABS   **CONTACT** +01 850 322 7532   **WEB** WWW.WORLEY.COM   **FORMAT** PC & MAC

MINIMUM SYSTEM
>> **LightWave 6.5 or higher**

MAIN FEATURES
>> **Real-time preview**
>> **Skin tools**
>> **Sub-surface scattering**
>> **Multiple specularity**
>> **Enhanced area lights**
>> **Edge tools**
>> **Art mode**
>> **Compositing tools**

Unless you run *LightWave* in a coal mine or on the surface of the moon, you'll have come across Worley Laboratories' superb range of *LightWave* plugins. It all started in 1997 with *Gaffer*, a surface shader that allowed more complex illumination effects than *LightWave's* own shaders, but it's taken five years for Worley to follow it up with *G2*.

G2 is far more than *Gaffer 2.0*: at its heart is an interactive preview that uses the buffers generated by an [F9] render to allow real-time manipulation of lighting effects. It revolutionises the way you light a scene, since it enables you to just open a *G2* preview, do an [F9] render and then start adding lights to see their effects in the *G2* window with final render quality. Suddenly, lighting ceases to be a hit and miss affair and becomes a creative activity you can adjust and fiddle with freely. The preview is pretty fast, although it uses an iterative algorithm, so you have to wait a few seconds for the blocky first pass to update into something more useful.

01

LOVELY SKIN

However, *G2* doesn't stop there, as there's also the *G2* surface shader that can be applied to an object's surfaces and which yields an advanced shading panel that gives control of myriad new factors. Most of these are simple photorealism tweaks, like fresnel effects, multiple specularity, and light exclusions, but *G2* also features a couple of really clever new technologies. Blurry raytraced reflections are implemented, as is sub-surface scattering, which works in the preview so you can adjust the light transmission of surfaces in real time.

There's even a 'skin mode' – a sub-surface model pre-tuned around the properties of human skin – just apply to your photoreal humans, adjust the settings, and relax. On top of that, *G2* has a couple of extras like the Luminous Shadow Darkening tool, which exists to match rendered shadows to a live-action background, a photomapping tool to remove the illumination from an image for subsequent use, and a texture map. *G2* also renders area lights in a method far superior to *LightWave's*. You can even switch *G2* into 'art mode', which uses an image as reference for the shading on surfaces.

Essentially, with *G2*, Worley has bundled a bunch of lighting and shading tools around the

> ## SUDDENLY, LIGHTING CEASES TO BE A HIT AND MISS AFFAIR

preview system, and thrown in a couple of clever extras as well (such as the skin shader). You could use *G2* religiously for all scenes or just apply it when you want to take advantage of a particular effect. It isn't the end to all *LightWave* lighting woes, as for example, it can't update shadow information without doing another [F9] render, so much of the 'look' of an image can't be interactively adjusted.

As with all Worley's releases, *G2* comes with a good manual written in plain English along with the usual assortment of cool junk (fake bank notes, comics, stickers and so on) and with a level of support and feedback that should put most large software distributors to shame. ■

02

[01] **A typical G2 session. The raw *LightWave* render (left) is being adjusted in real time in the G2 preview (right) with fresnel effects and gamut control**

[02] **The G2 interface is a bit clunky, but very streamlined. You can open as many surface and preview panels as you want, but by default, just two will show, which helps to eliminate screen clutter**

3D VERDICT   **7**

RANGE OF FEATURES	8
VALUE FOR MONEY	6

PROS Real-time interactive render preview
>> Super-fast sub-surface scattering >> Loads of useful render tools

CONS Quite expensive (*LightWave* itself only costs £1,000!) >> Limited by *LightWave's* architecture

Buyouts, contacts, and big contracts: Movers & Shakers is your window on the 3D jobs market. And once you've read it, why not get a job of your own – with the help of our classified section?

MOVERS

FUZZY SANDERS has left The Clinic to become the new Commercial Directors' Rep at London production company, Addiction. Sanders started her career in 1995 at the Jeff Wayne Music Group. Before joining The Clinic, Sanders did a brief stint at Adelphoi Music as Head of Production, working on high-profile projects such as the BBC's *Walking with Dinosaurs* and campaigns including Schweppes Lemon and Adidas. Addiction was founded in 1998, and its client list includes Nike, Sony PlayStation, Parlophone, and EMI.
www.addiction.tv

GEOFF SHAW, former Director of R&D at world-leading mocap manufacturer, Vicon Motion Systems, has joined NaturalMotion as Product Director. Shaw will oversee NaturalMotion's Virtual Motion Capture series, based on the company's Active Character Technology, which evolves biomechanical character motion using neural networks.
www.naturalmotion.com

The esteemed ex-editor of this very magazine, **BEN VOST**, has joined NewTek Europe as its new press relations, tech support, and all-round writer bod. Vost worked for Future Publishing for five years editing *Amiga Format* and then *3D World*, before going freelance just over a year ago. Since his relocation to France, his favourite saying has been, "Ce me fait chier!" Thankfully, he's only used it in test situations so far.
www.newtek-europe.com

WHAT DO YOU DO, THEN?

DARREN DUBICKI

AGE: 30
JOB: Lighting/rendering artist
AT: Aardman
URL: www.aardman.com

WHAT IS A TYPICAL DAY AT AARDMAN?
Marmite and toast, then, depending on the project, discussing the schedule with the director and producer. I generally don't have a typical day as the job is defined by the project at the time. I could be working on a pitch, commercial, live-action composite, short film, or my own projects. But, generally, at the start of a project I'll spend some time figuring out the appropriate lighting setup for the shot, and indulge in a lot of test rendering.

WHAT WERE YOU DOING BEFORE YOU GOT YOUR CURRENT JOB?
I was Head of Layout at Aardman Features. The job involved using 3D software as a pre-direction tool to take storyboards to an animatic stage where the director could get a sense of space and timing at a much earlier stage of film development. This information was also used in the set-design process, where we designed and built accurate models to send to the set builders. The director then had virtual sets to play with weeks before the set was built and placed in the studio.

AND WHAT DID YOU HAVE TO DO TO GET IT?
I was involved with concept design during early development of *Chicken Run*. From that point I was approached to test the notion of pre-visualising sets and shots in the computer. I felt it was a natural progression, from freehand illustration and concept design for short animated films into large-scale productions using the computer as another design tool.

WHAT ONE PIECE OF ADVICE WOULD YOU GIVE TO A YOUNG 3D ARTIST HOPING TO BREAK INTO THE INDUSTRY?
Don't spread yourself too thinly. More and more people are sending showreels that don't really give a sense of where their skills stand out. I'd rather see a short piece of animation with lots of character study, observation, and no frills. That is, if you're determined to be an animator. In terms of lighting and texturing, if you feel that's your area of expertise, then concentrate on the relevant tools and then just practise. It also pays to be able to work as part of a team so try lighting someone else's animation, too.

WHERE DO YOU HOPE TO BE IN FIVE YEARS?
Working a fine balance between production designing/directing and blissfully illustrating/painting from my studio near a river bank somewhere. You can but dream.

SHAKERS

FUZZYGOAT is the new enterprise formed by ex-Mill Film employees, Gary Coulter, Caroline Garrett, and Neill Murdoch. Coulter, Garrett, and Murdoch were instrumental in designing, developing, and running Mill Film's *LightWave* pipeline in addition to serving as 3D Digital Supervisors, Supervising Animators, and Systems Developers on a number of films spanning seven years of production.
www.fuzzygoat.com

Leading broadcast posthouse, **TSI**, has established a state-of-the-art 3D animation department headed by animator Simon Allen, who has joined from Molinare. TSI's 3D set-up is based around *3ds max*, *Bryce*, *Photoshop*, and *Premiere* and *Realviz* image-processing technology. TSI is one of the largest independent broadcast service companies in the UK, and provides services for some of the UK's leading broadcasters and production companies including the BBC, Channel 4, and Discovery.
www.tsipost.co.uk

MICROSOFT is gearing up for a series of independent screenings of digital films using new Windows Media 9 technology. The company is to screen a series of eight movies in 25 cities around the United States. The screenings mark the latest step by Microsoft into the digital cinema arena, following previous experiments to bring the film *Wendigo* to the big screen.
www.windowsmedia.com

EXHIBIT YOUR CREATIONS

If you're an up-and-coming 3D artist, our Exhibition section is the place to showcase your work. Each issue, we display the best illustrations and animation stills to have been produced outside of the major design houses. To get your own images included, just follow the submission guidelines below.

Please note that contributions must be submitted on the basis of a non-exclusive worldwide licence to publish, both in printed and electronic form, by *3D World*.

We also regret that we cannot reply to every letter or email we receive in person. Selecting and assembling the images does take time, so if your work has not yet been published, please be patient. If we feel your contribution is suitable, it will appear eventually: either in the magazine, on the cover CD, or on our Web site.

SUBMISSION GUIDELINES

>> Ideally, images should be rendered out at least 3,000 pixels wide or high.
>> Images under 500 pixels in size will *not* be used in the magazine.
>> Nor can we print smaller images that have been resized in *Photoshop*.
>> Always include a text (.txt) file with your images containing the following things:
  • Your name
  • Your email address
  • The URL of your Web site
  • The title of each image
  • How the image was created
  • The software you used to create it
  • A little bit about yourself
>> Don't feel obliged to write pages: around 200-300 words of text will do.
>> Don't rely on a separate covering letter: we have a tendency to lose those!
>> Files under 3MB in size can be emailed to 3dw.exhibition@futurenet.co.uk
>> Larger files may be sent on CD or Zip disk to: Exhibition, *3D World*, Units 1+2 Cotterell Court, Bath, BA1 2NP, UK
>> We can't return your CDs/disks, so please don't send us your originals!

ON THE CD
More Exhibition images.

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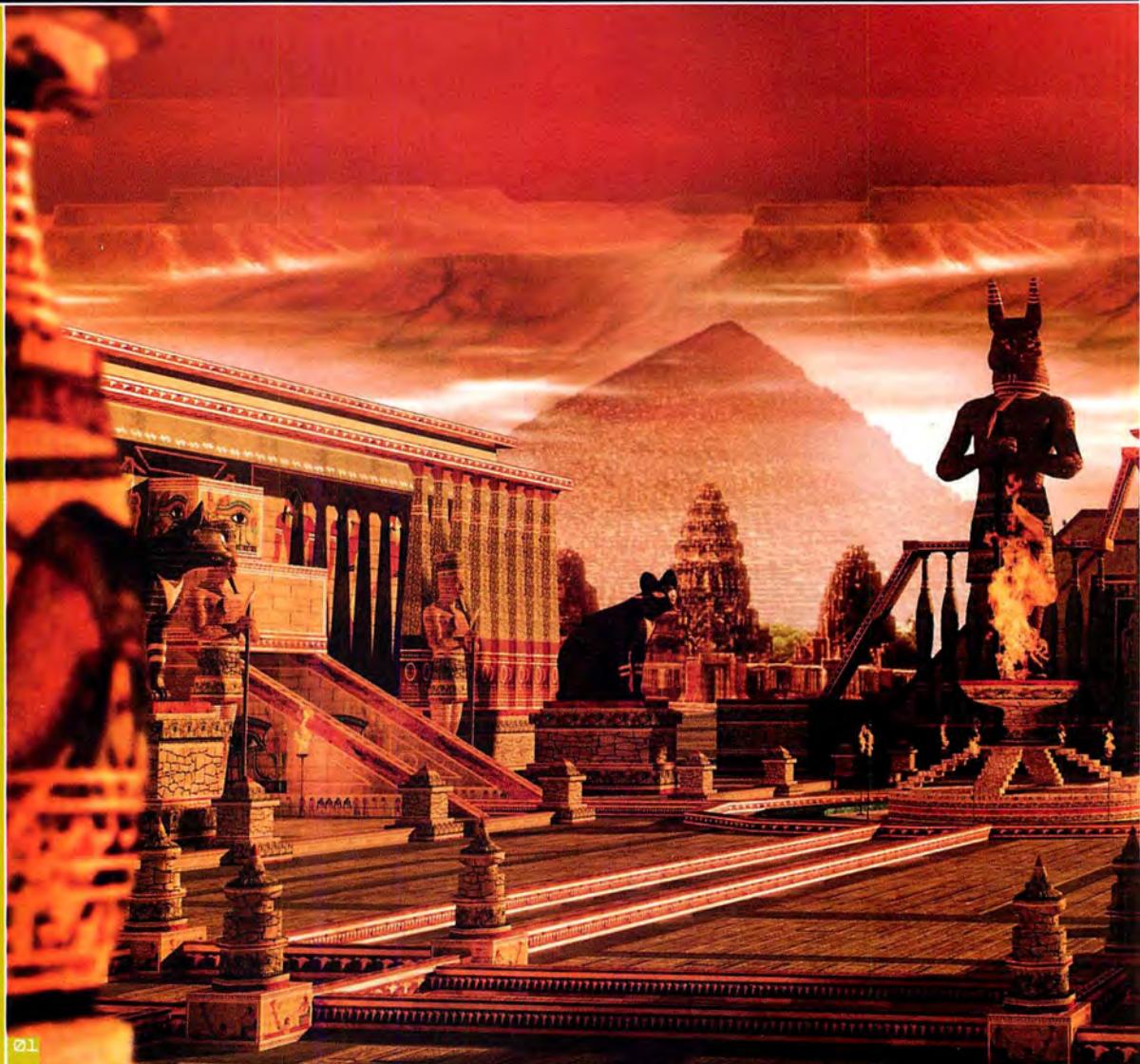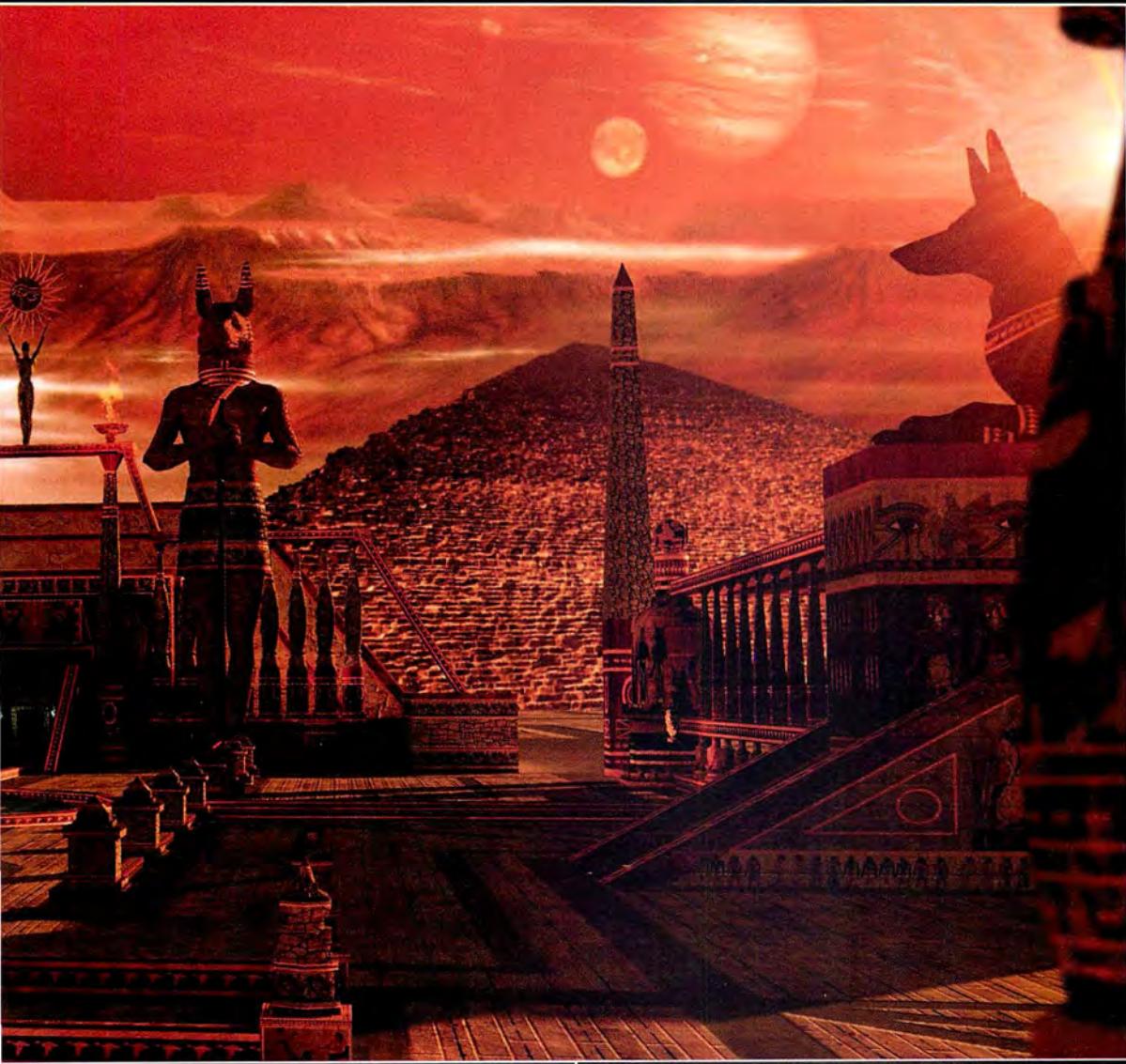
USING: *3ds max, Photoshop*

"After finishing art school at 17 I joined the army, but continued painting while at the plant in my town. I had to make many pictures to order, but I always tried to find some time to create things I liked. Some time later I began to work with computers. I was really fascinated by them, so I took a one-year course, which was when I realised that 3D was ' exactly what I needed. Eventually, I took a job in Hamburg, creating, ahem, virtual worlds on the Internet. This lasted three months before the company went bust. I was unemployed for some time, but for the last three months I've been realising my dream of working for my own firm."

[e]: info@lotusart.de
[w]: www.lotusart.de

02 CHRISTOPHER HUGHES
F1 PRACTISE

USING: *trueSpace6, Corel Draw 9*

"I work as a mechanic at a motorbike shop. I bought my first 3D package, which was *trueSpace5*, after reading about it in your magazine about 18 months ago and haven't stopped using it since! This is the first picture I feel might be good enough to be in your magazine"

[e]: hughez@aol.com

03 PETER LAMMERS
RINGS

USING: *Blender 3D, VirtuaLight*

"I'm a 26-year old graphic designer/3D animator modeller from Holland. I learnt my skills with *Strata Studio Blitz* while working for several advertising studios. After a few years my girlfriend's brother asked me to help him out with a 3D project at the company he worked for. The rest, as they say, is history.
I made the rings with many 3D tools. First of all, the initial object was created with *Blender 3D*, a free open-source application. I rendered them with *VirtuaLight* (which is also free) on my PIII 700. (I sure need a new fast computer.) The image took about two hours to render at 4,000 x 3,000 pixels. Why did I create this image? *I just love those illumination and caustics effects!* Check out my site for more funky images!"

[e]: hello@dotblend.com
[w]: www.dotblend.com

EXHIBITION

01 MICHAEL A NICHOLSON
PART-1

USING: *LightWave 7.5*

"I am currently doing a *Visual Basic* programming course at Spokane Community College. Before that I spent 15 years programming machinery at a potato processing plant. I do a lot of 3D modelling for myself mostly. It's just a hobby. I have been using *LightWave* since version 3.5, but I also use *Bryce*, *Adobe Photoshop*, *Paintshop Pro*, *trueSpace*, *AutoCAD LT*, and various other software packages, but I always create things from scratch using a drawing or sketch, first.

I run Windows 2000 on a dual PIII 1.13 GHz machine, with 1.15GB RAM, a 128MB NVIDIA graphics card, and four hard drives with a total capacity of 300GB. I am still building the PC, constantly changing things as I think of them. Friends tell me I could do it differently, but it's an ongoing thing and is all powered by my imagination, which is certainly a powerful tool. I made PART-1 with *LightWave 7.5*, performing the image mapping in *Paintshop Pro*."

[e]: webmaster@mangraphics.com
[w]: www.mangraphics.com

02 JAIME FERNANDEZ MURO
FROG FINAL

USING: *3ds max 4.2, finalRender 1.5*

"I am a Spaniard, but I'm living in the UK at the moment. I work for Codemasters as a 3D artist making computer games for the PlayStation 2. I have always been fascinated by 3D, and so I send you my work. It would be great if it made the cover for *3D World* if it's good enough! If not, I'd appreciate any suggestions."

[e]: jaimef@codemasters.com

03 GIANCARLO D'INCOGNITO
(CLOCKWISE FROM TOP)
500_02, 500_01, OGRE,
HAYABUSA01,

USING: *LightWave 3D*

"I'm 3D modeller and animator at CCBC in Bari, Italy. I work almost entirely on architectural rendering and animation with *LightWave*, but I've also made a few intros and models for videogames. The ogre is a test for a character set-up for a videogame, using HDRI and Saslite, included with *LightWave*. *Hayabusa01* is an old model of a bike to which I added a biker during some test of Inverse Kinematics. The last model I created is the Fiat 500. I was a bit bored of dream cars so I tried to model this vintage car. It may not be a Ferrari or a Lamborghini, but I think it's so nice..."

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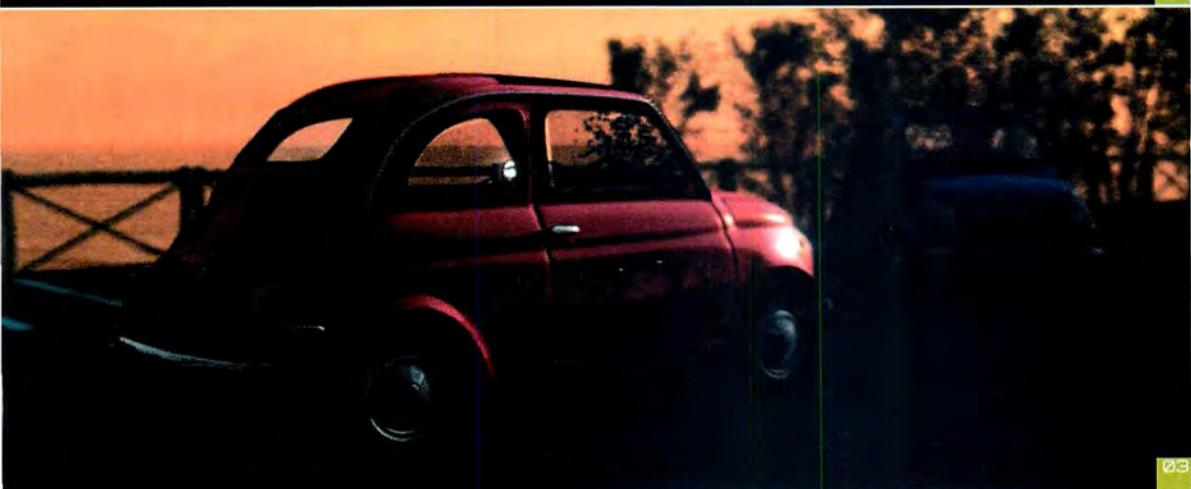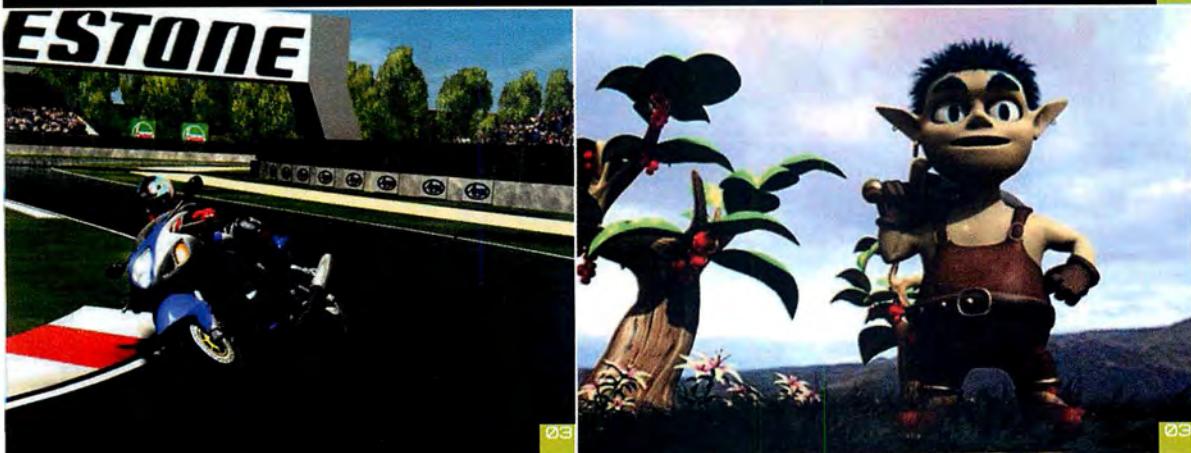
EXHIBITION

01 ANDREW STEPHENS
TROLL, ANDY

USING: *3ds max 3*

"I am a self-taught artist from a fine-art background. I'm inspired by organic shapes like bones, human anatomy and such. I prefer to design characters and landscapes from scratch, but I based *Troll* on a Warhammer model – I was instructed to create anything from the Warhammer family following a job interview. *Andy* is my first attempt at low polygon modelling, which I created for a training exercise.

I made *Troll* with splines, and textured it with the standard UVW mapping that comes with *max 3*. I made *Andy* with edit mesh tools, and textured him with the UVW unwrap tool."

[e]: kage@kage.fsbusiness.co.uk
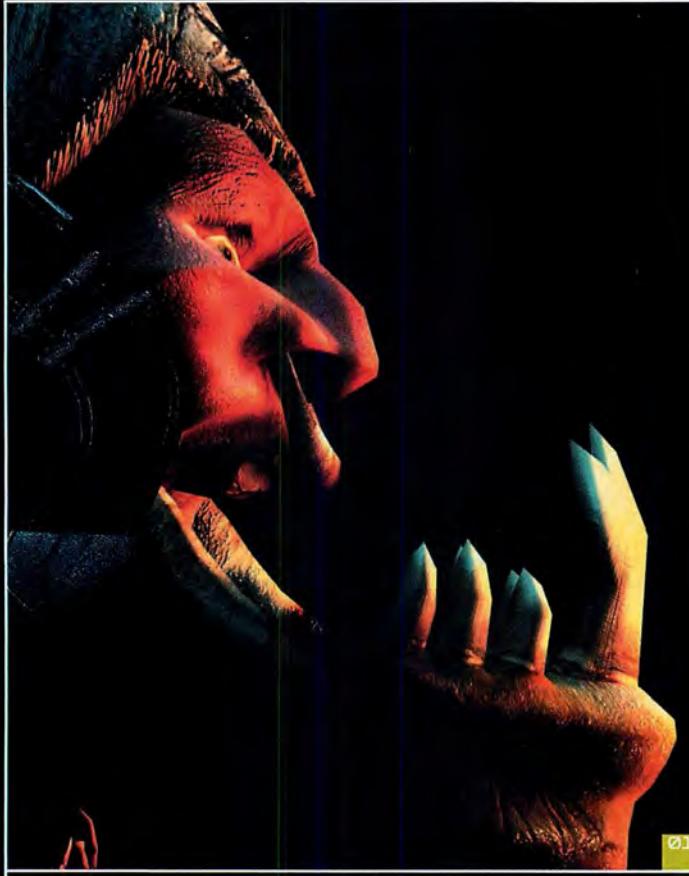
02 CARLES PILES
PIRATES COVE

USING: *Cinema 4D*

"I'm a 32-year old artist from Spain. I set aside my passion for drawing when I got my first job as a graphic designer, but my enthusiasm returned when I came across 3D programs. 3D enables me to do almost anything that passes through my mind. I think it will always be my working tool because the best results I ever obtained were done in 3D.

I assembled *Pirates Cove* with several elements. Each component is formed by a fractal terrain. I used a 'small mountain' for the base, some lofted splines for the pillar bodies, and another (inverted) terrain as the top of the pillars and ceiling. I cloned this main element several times, changing the appearance a bit by scaling and rotating it. I made most of the other components with cylinders, cubes, and extruded splines."

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ByArtist=Y&Artist=Carles_P
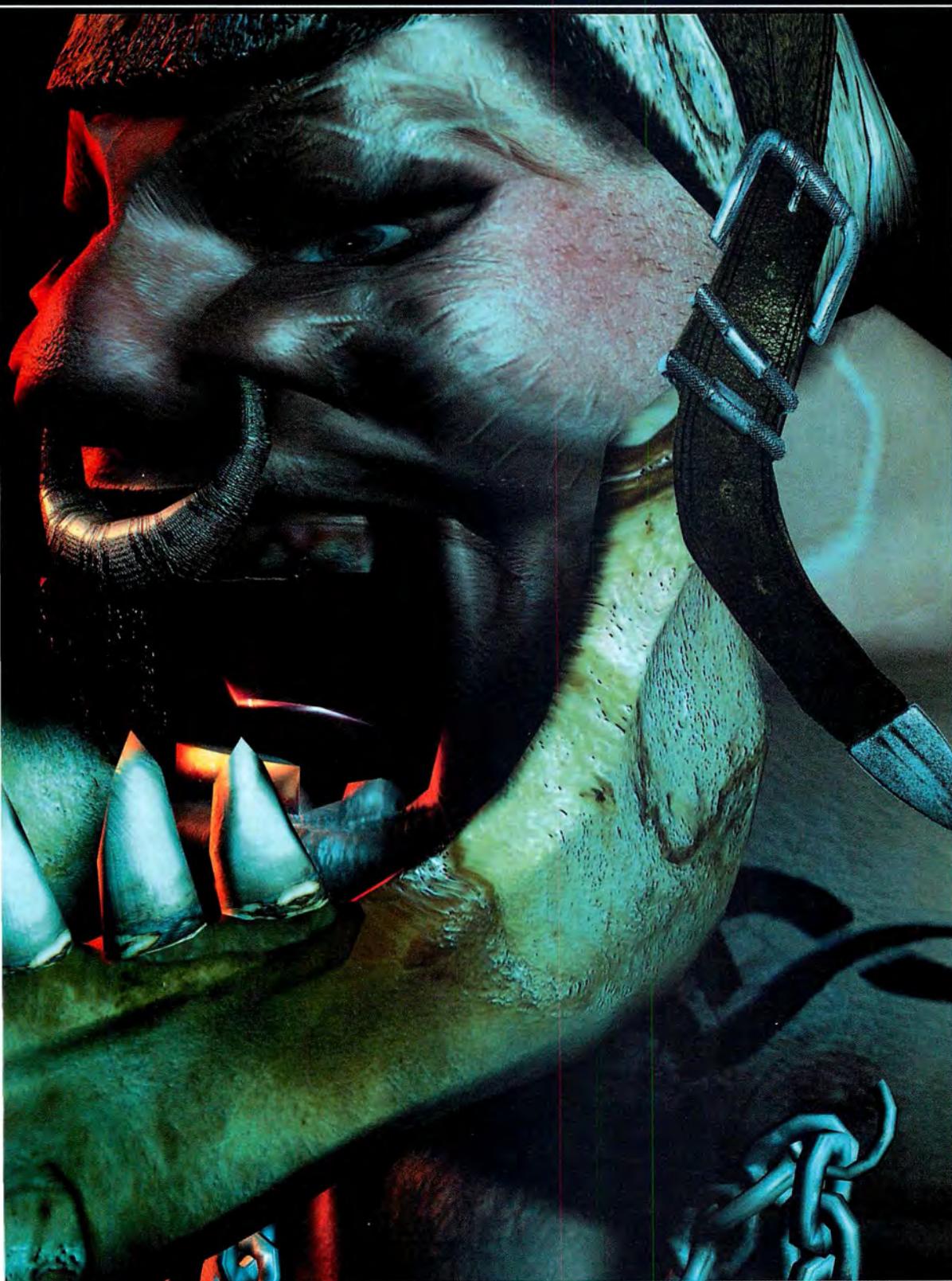
03 OLIVIER VAN TILBORGH
ELEVATOR

USING: *LightWave*, *Photoshop*, *After Effects*

"I'm a 32-year old Belgian living in Brussels. I've been into 3D since the eighties when I saw for the first time those magic images in the film *Tron*. I started out with an Amiga 500 and Atari 1040ST with *Imagine* and *POV*. The render times were really long, sometimes more than a day. I think 3D really started coming into its own at the beginning of the nineties with the Intel Pentium, but unfortunately, I had to wait until 1996 to have my first P166. I looked at *3ds max*, but I didn't like its scanline render, then I discovered *LightWave* in 1997.

I created *Elevator* to gain experience in lighting and textures, which I created in *Photoshop*. The scene contains 800,000 polys, 246 surfaces, and 107 lights. I made different layers, image, geometry, volumetric light, sparks, dust, and fog, then used *After Effects* for the compositing and posting."

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THE ABYSS

ILM's groundbreaking work on James Cameron's sci-fi adventure featured the industry's first 3D CG character, as well as the company's first all-digital composite work **BY BILL DESOWITZ**

**MAIN: The pseudopod character in *The Abyss* was the first time a three-dimensional computer graphics character had been successfully modelled, animated, and composited into a live-action feature film**

TOP: An early version of *Alias* was used to model and animate the creature

MIDDLE: Applying a random ripple algorithm to the surface gave the illusion of water

ABOVE: Reflection was achieved by taking photos of the set in all six directions, digitising the images and creating a cube whose inner surfaces were the scanned images

James Cameron's *The Abyss* (1989) represented a breakthrough, not just for effects house Industrial Light & Magic, but for the CG industry as a whole. Firstly, it was the first feature to use computer graphics to represent a three-dimensional character – in this case, an aquatic alien creature known as the 'pseudopod' – rather than relying on wireframe simulation. And secondly, it was the first time ILM had become production-oriented – previously, it had the reputation of having an R&D mindset. With this in mind, Computer Graphics Designer John Knoll was given the task of making sure the division stayed on target and on schedule.

"After toying around with a number of different ideas – really weird things like clay animation – [Visual Effects Supervisor] Dennis Muren thought computer graphics was the only sensible approach [to animating the sequence]," Knoll explains.

The sequence starts with the surface of a pool of water rising up in the centre. Then the alien's tentacle forms, and we see a series of POV shots going through the underwater facility in which the scene is set. Meanwhile, the first time we get a good view of the alien occurs after the crew wakes up. It proceeds to mimic the face of actress Mary Elizabeth Mastrantonio, before changing to mimic Ed Harris. Mastrantonio reaches up to touch the alien, but its face collapses back down into its original surrounded shape and peers into a different part of the facility, where it is discovered by a team of Navy Seals. Frightened, the Navy Seals close a door on the alien, slicing it in half. The piece from the other side of the

door falls down and splashes water on the floor, while the other end rears up and disappears.

"Jay Riddle, the CG supervisor, put a very quick alien test together in [*Maya* precursor] *Alias* [*2.4.2*] that got Cameron's attention," says Knoll. "The final rendering was done in *RenderMan*, and [Computer Graphics Animators] Mark Dippé and Scott Anderson wrote a variety of tools in-house that would enable skimming the surface [of the water], putting all the ripples on the surface of the alien, and getting the right mixture of reflection and refraction into the elements. With *RenderMan*, for instance, we were able to put the faces on the end of the alien pod structure and get all those nice procedural ripples that Cameron likes."

"The first pass on the pod was to animate a spline that represented the centre line. We also animated a bunch of circular cross sections of the pod at each of the control vertices of the spline. And then there was a program called *Skin* that would take those cross sections and place them perpendicular to the spline and then skim that surface with a bunch of patches. Another program would place a bunch of wave generators in space and add all the ripples to the surface in geometry, subdividing according to the sum of the weights of the noise generators."

Animations were carried out in *Alias* for basic pod shots. However, various facial animations required additional tooling. For this, the animators applied an updated version of the award-winning *Morf* program (previously written by Software Developer Doug Smythe for

> **"[VFX SUPERVISOR] DENNIS MUREN THOUGHT CG WAS THE ONLY SENSIBLE APPROACH…"**
>
> **John Knoll, ILM**

#097

ILM STAYS AHEAD OF THE COMPUTER GRAPHICS CURVE

Before *The Abyss*, Industrial Light & Magic's computer division had already made great strides with the 'Genesis sequence' for *Star Trek II: The Wrath of Khan* (1982), which marked the first completely computer-generated shot. Then in 1985, the company made further breakthroughs in computer graphics with the first completely computer-generated character with the 'Stained Glass Man' in *Young Sherlock Holmes*.

Yet it was the groundbreaking morphing work on *Willow* (1988), that earned ILM an Academy Technical Achievement Award, which allowed the company to tackle the complexities of *The Abyss*. ILM subsequently stepped up to create the first computer-generated main character with the T-1000 in *Terminator 2: Judgment Day* (1991) and a year later used D1 digital video technology to complete post production and visual effects on *The Young Indiana Jones* TV series, which won an Emmy for digital replication of actors and digital matte paintings and compositing.

Since then, ILM has achieved breakthroughs in human skin texture (*Death Becomes Her*), CG dinosaurs (*Jurassic Park*), seamless digital interaction with historical figures (*Forrest Gump*), a photoreal cartoon character (*The Mask*), fully synthetic speaking characters (*Casper*), photorealistic CG hair and fur (*Jumanji*), a fully virtual set (*Mission: Impossible*), and the first all-digital feature movie (*Star Wars: Episode II—Attack of the Clones*).

Willow). This allowed the fluid, onscreen transformation of one object to another. "We got the Cyberware scans of our principals in all the poses that needed to be depicted: Mary Elizabeth with a neutral expression, smiling, and sticking her tongue out," Knoll adds. "We got Cameron to direct the actors to achieve the proper facial expression to go at the end of the pod. That went through his normal editorial process. I spent time on the Moviola breaking down the cut with polaroids of all the different facial expressions, which I used as keyframes.

"I used the new version of this program that could morph the Cyberware data sets [cylindrical arrays of 16-bit height field values] to animate them. Then Dippé wrote another program that could transfer that cyberware data to the front of the pod, turning it back into geometry we could render and blend nicely with the rest of the pod body."

PUTTING IT ALL TOGETHER

The Abyss also featured ILM's first all-digital composite. This occurs when the door closes on the pod and we see the alien go from its cylindrical shape to a big splash of water on the floor. Supervisor Stuart Robertson warned that the combination of soft and hard splits that had to travel in the shot were going to be too difficult to execute optically.

"The reason that was a big deal for us was that doing an all-digital composite on the high-res frames took up a very large amount of disc space," Knoll explains. "At the time we had about 900MB of online storage for all the elements, including background plates on the movie. I came up with this really terrible Rube Goldberg scheme that would involve two tape drives. We had a script that would read a frame off one tape drive, then perform a composite. Once saved to that disc, it would write that frame to another tape drive and clean up after itself. It wasn't a practical way of working – if something went wrong, you had to rewind all the tapes – so we increased the storage capacity to composite online."

Overall, a team of about ten ILM staff spent nearly a year on *The Abyss*. Interestingly, James Cameron instructed the animators that if the sequence proved too much to handle he was willing to cut it. Yet all that hard work paved the way for the company's next big feature, *Terminator 2: Judgment Day*, also directed by Cameron. "When he wrote the script for *Terminator 2*," Knoll recalls, "he was writing effects that could only be done with computer graphics."

In this way, the technical advances made on *The Abyss* raised the bar not only for ILM, but for the computer graphics industry as a whole. ■

ABOVE: **The B-spline model of the pseudopod is rendered and shaded, showing depth**

BELOW: **To give the character the feel of being translucent, the pseudopod had to be both reflective and refractive. The refractions were generated by proprietary software that altered the background plate directly behind the creature**

FACT FILE

TITLE: *The Abyss*

BY: Industrial Light & Magic

DIRECTOR: James Cameron

DURATION: 146 minutes; special edition, 171 minutes

PREMIERED: 1989; special edition premiered 1993

WEB: www.ilm.com

CREDITS: Director, *The Terminator* (1984), *Aliens* (1986), *Terminator 2: Judgment Day* (1991), *True Lies* (1994), Titanic (1997)

FUTURE PROJECTS: *Terminator 3: Rise of the Machines* (co-writer)

IN KEY FRAMES EACH MONTH
THE INSIDE STORIES OF MILESTONES IN 3D HISTORY

Isaac Kerlow

Disney's Director of Digital Production speaks to 3D World about the integration of digital processes into conventional workflows, and looks forward to the coming proliferation of inexpensive filmmaking tools   BY STEVEN RAYNES

WHAT DO YOU DO AT DISNEY?

I'm responsible for exploring new media and new technologies, and planning their integration in production pipelines throughout the company. I'm currently involved in a variety of initiatives including setting new standards for 24P HD production, integrating 24P in the 3D computer animation and vfx pipelines, and delivering digital dailies to the desktop.

WHAT ARE YOU WORKING ON AT THE MOMENT?

Right now I'm involved in projects that are still in development, which means I can't talk about them. Sorry about that, but much of what I'm doing at the moment is about integrating 24P HD into the live-action and 3D computer-animated movie pipelines.

YOU TALKED ABOUT DIGITAL WORKFLOWS OF THE FUTURE AT THE 3D FESTIVAL RECENTLY. CAN YOU TELL US A LITTLE MORE ABOUT YOUR VISION?

Many of the 'new' technologies we've been hearing about for a decade are finally making their way into the mainstream and changing the ways in which animators and filmmakers work. I'm talking about technologies like off-the-shelf computer systems with fast clocks, graphics cards with enough power to deliver real-time full-motion rendering previews, and more cost-effective software for tracking cameras. We've already started to see the initial effects of this technical, production, and creative transformation. In the last few years, for example, 'effects' movies have had more complex effects throughout the movie than ever before. Even films, such as *Amélie* and *American Beauty*, are taking advantage of sophisticated digital work.

If we look at *Star Wars 2* and *Spy Kids 2* we can see early previews of what might become the standard production/creative model in future Hollywood studio and independent productions. Both movies are good examples of productions with different scales of complexity that recorded the live action using HD video, used blue/greenscreen techniques and 3D effects, and assembled the film using the Digital Intermediate approach.

WHICH IS?

The basic idea behind the Digital Intermediate (also called Intermediate Digital Master) is to bring all the elements in a production into the digital environment, regardless of the media used to capture or finish the material. For example, an effects movie might be shot on a combination of 35mm film and 24P HD video. In such

cases, film would be digitised and HD video would be saved as digital files. The effects would be created digitally or converted into digital files. So the digital intermediate process provides increased flexibility in the compositing, animation, and editing processes because all the elements exist in a single 'bucket'.

NO FILM RECORDERS THEN?

Film recorders are going to be around for a long time, and the new generation of laser recorders is starting to exceed the range and functionality of the earlier CRT-based recorders. In this respect, the beauty of the digital intermediate process is that it simplifies the output to film by keeping all frames of the movie in a single digital format. It's precisely this blending of traditional and innovative processes that is at the core of the second edition of *The Art of 3D Computer Animation and Imaging*, published in 2000. One of my reasons for writing this book was to reunite the sometimes disparate worlds of traditional production and digital production. The third edition, now in its early stages of planning, should include more examples of digital intermediate productions.

CAN WE EXPECT TO SEE THESE TECHNOLOGIES ACROSS THE INDUSTRY?

The good news is that most of these technologies are available to the mainstream animation community. I am sure Disney, other Hollywood studios, and large production facilities will continue to use these technologies, but a new breed of smaller and nimbler production groups and independent artists will also be able to afford and master them.

BUT WON'T THERE ALWAYS BE AN EXPENSIVE VANGUARD THAT KEEPS THE SMALL PLAYERS OUT OF THE BIG PICTURE(S)?

I think there has always been, and always will be, a vanguard of creators that pushes the envelope. But that vanguard is not always based on more expensive tools. Sometimes the most innovative work is done with cheaper and simpler tools. Look, for example, at the Italian neorealist movies from the 1940s and early 1950s, the French New Wave cinema of the 1960s, or the work of Canadian animator Norman McLaren or Japanese Hayao Miyazaki, or the movies recently created by the Danish Dogme 95 group. They all pushed different creative envelopes with fairly simple, and cheaper than average, technologies.

Does the digital revolution spell the end of the big studios' hegemony? Isaac Kerlow thinks… maybe
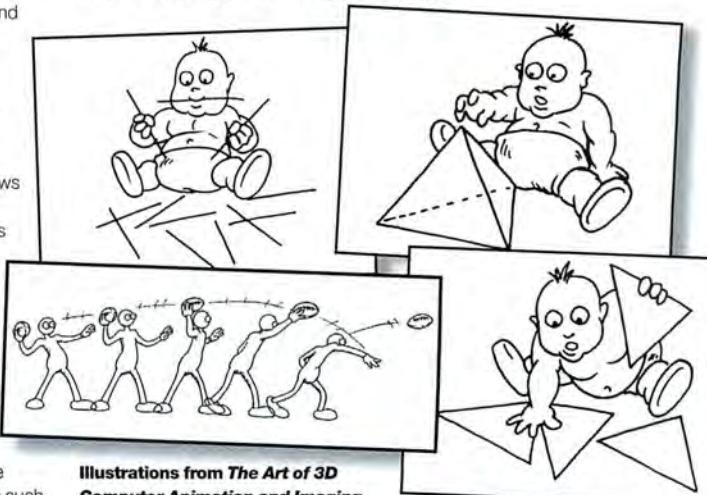
Illustrations from *The Art of 3D Computer Animation and Imaging*

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